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THE FUTURE OF SHANGHAI

THE RESURRECTION OF A NATION

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JUNE, 1934
No. 6

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ENGINEERING FINANCE COMMERCE

VOL. XXX SHANGHAI, JUNE, 1934 No. 6

Views on Japanese Policy

By WILLIAM R. CASTLE, JR., Former Under Secretary of State of the United States, in "The New York Herald Tribune"

WHEN a national doctrine widely affecting international treaty rights is in the making it is generally kept secret or is confidentially discussed with the nations which will be most affected. When the announcement is to be made the government very carefully chooses the time and method in order to make as good an impression as possible. As a rule the announcement is more or less formal, either through publication of diplomatic notes or through a message to the parliament.

It was in this latter manner that President Monroe announced to the world the doctrine later called by his name. It was through publication of the correspondence with other governments that John Hay announced the policy of the open door in China. It is frequently, also, true that the great changes in law and international relationships result from international conferences, either following war or called for some specific purpose. A good example of the latter is the Washington Conference of 1921-22, which produced not only the limitation of capital ships but also the treaties concerning China.

Time Not Carefully Chosen

It is to be remembered that the Japanese government has chosen none of these methods to make known its new China policy; this fact makes one wonder whether the policy is actually fixed, whether these rather vague pronouncements by minor officials may not be in the nature of trial balloons. The Japanese government did not discuss the matter with any other nation. The time chosen for the story to become public was not carefully chosen in so far as the effect on world opinion is concerned, although it may well be, as the press has pointed out, that Japan believed Europe to be too busy with its own suspicions and incipient disputes to care much what went on in the Orient. I am inclined to feel that in all probability Mr. Hirota himself is not any too pleased to have this question thrown, at this time, into the international gossip mill, unless—which I do not believe—the policy is purely tentative and the story was put out merely to get the reaction of other countries.

When I was a member of the Department of State we had the habit of discussing and therefore of formulating the foreign policy of the government on specific issues by exchanging memoranda, this often being preliminary to a personal conference between interested officers. Toward the end of the discussions I might have written a memorandum for the use of the Secretary in which I should have said: "The following is the concensus of opinion among the interested officers of the department as to what stand our government should take toward "—whatever was the question at issue.

Now, if a copy of that memorandum had found its way to the office of the man in charge of press relations, and if Mr. McDermott had been anything but a very wise young man, that copy might well have found its way into the hands of the press. It would have been an error, but foreign governments would have delighted in calling it a calculated indiscretion.

I may be entirely wrong—but is it not worth considering whether something like this may not actually have happened in the Gaimusho (Japanese Foreign Office)? We at least must not lose sight of the fact that the "statement of policy," as we have it now, can be partially or even completely repudiated by the Japanese government at a moment's notice. It is in no sense "official"—yet. That is a fact which must not for an instant be lost sight of because to do so would be a disaster.

Chorus of Disapproval

Already a chorus of disapproval has made itself heard. This is both natural and right, because if the intentions of the Japanese government have been accurately stated we have a right to be deeply displeased. The policy as enunciated would certainly seem to make China a vassal state to Japan, to close the door on foreign trade in China, to be a flat repudiation of the Nine-Power Treaty of 1922 and, indeed, of all the treaties concerning China. The policy as amplified would seem to deny to foreigners the right to sell to China airplanes or anything which might be turned to military use, to lend money to China except with the concurrence of Japan, or to send technical instructors to China.

This has not been officially announced as the policy of Japan. If, however, the governments of the world listen to the clamor of the anti-Japanese and immediately protest to Japan that government will be compelled to answer with a definition of its policy; and in order not to "lose face," it in all probability will be forced to adopt very much the policy outlined in press dispatches. I have no doubt that the Secretary of State fully realizes this danger, since he has, among the permanent officials of his department, highly trained men who know the Orient. We must not be the means of forcing the adoption of a policy which we deplore.

The first duty of the Department of State seems to me to be to sit tight until their new Japanese policy has either been officially defined or forgotten. If the world and Japan permit it to be forgotten we shall all be exactly where we were a few weeks ago.

The second duty of the department is of supreme importance. That is that, granted the Japanese policy to be what it now seems, nothing shall be permitted to make the issue appear as one peculiarly between the United States and Japan. We are not peculiarly the keeper of China. Our business interests in China are not comparable with those of Great Britain and our political interests, by reason of the Philippines, are not comparable with those of the Soviet. The foreign press is already accenting the growing conflict between "Japan and America." Moscow is already pouring out propaganda to the same effect, and the Ambassador of the Soviet in Tokyo has made an ostentatiously friendly call on the Japanese War Minister.

No Danger of War

All the nations of the world, disliking the new policy quite as much as we do, will be trying to persuade Japan that it is the United States which leads the opposition, and some of them will add other suggestions which are anything but kindly. There are certainly two nations, and possibly more, which, unfortunately would not deeply regret a war between America and Japan; but there will never be any danger of such a war if the Department of State is eternally on guard.

This new policy of Japan—which in its essentials is not a new policy at all, but a restoration under different circumstances of the fundamentals of the philosophy of the Japanese state—is often spoken of in Japan and abroad as the Japanese Monroe Doctrine. It would never be called that in Japan, and it would cause no particular worry in the United States or in China, if it were really a replica of our own Monroe Doctrine. After all, that much misunderstood policy is simply an assertion that the United States will not permit any foreign nation to gain political control of any one of the independent American nations. It gives no right to interfere in the domestic affairs of any one of these nations; it has no suggestion of imperialism; it does not imply any economic domination or any restriction of trade. The American government makes no protest if Bolivia hires German officers to train her army or if some other country buys French airplanes.

If Japan proclaimed a true Monroe Doctrine for the Far East it would have no meaning except that Japan would prevent, if it could, any new acquisition of territory on the part of Europe or America in the Orient. It would have no more effect on American supremacy in the Philippines or French supremacy in Indo-China or Dutch in Java than our own Monroe Doctrine has on the French ownership of Guiana or the British of Jamaica. China might be annoyed at having its political integrity guaranteed by Japan, because China shuts its eyes to its own weakness; but in spite of this it would be safer than it is now.

The trouble is that the Japanese thesis is not a true Monroe Doctrine if the statements already unofficially published are true. If officially proclaimed it would be rather a declaration of supremacy in the Orient, of the right to interfere at will in the domestic affairs of neighbor nations. For the world the saddest aspect would be the cynical disregard of treaties, the purely selfish destruction of the rights of other nations.

Sino-Japanese Differences

I heard a man say, with the usual exaggeration of aphorism: "The difference between China and Japan is that China has adopted all the worst qualities of Western civilization and Japan all the best." If Japan should calmly break the provisions of the treaties by which it, like other nations, is bound, one would have to admit that Japan had failed to grasp the vital fact that respect for the pledged word is one of the most important bases of Western civilization. As a lifelong friend of Japan I hope this may not prove to be the case.

But if the worst fears of the pessimists should prove true, if Japan should make the incredibly foolish mistake of announcing a doctrine which would be an insult to all nations having interests in the Far East and a flag of fear to all others, what are we going to do about it? We must remember that we are not wholly free of blame. In the nine-power treaty we insisted on the sensible things, the continuation of the policy of the open door, the integrity of China, and we subscribed along with these sensible things to the theory that we were dealing in China with a regenerated people who would so scrupulously fulfil all their international obligations that the whole world would be better for watching them.

China since that time has broken every obligation it undertook, except payment of the Boxer indemnity, and we have done nothing whatever about it. The Japanese suffered in patience until the military ran away with them in Manchuria and put Japan in the wrong. Is it wholly surprising that the Japanese government should say: "Nobody else takes any steps to make China put its own house in order, therefore we must do it ourselves?" Such an attitude seems to me if not defensible at least wholly understandable. I do not agree with the many who say that the announcement of the new doctrine means that the military is again in control. It sounds so much more like a foreign-office memorandum which probably should not have been written, and certainly should not have been published.

Japan-Soviet Relations

But if it proves to be the determined Japanese policy I can only repeat the question, "What are we going to do about it?" The first part of the answer is obviously to employ diplomatic methods so efficient that we cannot possibly be segregated from the rest of the world and put in the position of being the one adversary of Japan. The next step might be, if the Japanese policy is officially communicated to other nations, a joint declaration to Japan by all the nations of the world that we expect the observance of treaty obligations and the maintenance of equality of trade for all—a declaration which certainly should not be inspired by the United States. To this Japan would agree. Danger of very serious misunderstanding would then arise only if Japan attempted to interfere with legitimate trade, which is unlikely.

This seems a dull program. It has little romance and less glory. Even as I write these words our government may be moving in the matter. I hope not because this dull program is the only safe one. We have no idea what has been going on behind the scenes. China strenuously denies that any agreement with Japan is in sight, but this means nothing whatever. We have no idea what lies behind the stream of propaganda issuing from Moscow. Instead of the much talked of war there may well be in process of incubation a complete and friendly understanding between Japan and the Soviet.

Some such program, furthermore, is a peace program. Because of our long tradition of friendship with China, we should be sorry to see her independence diminished from any source—but we should not go to war about it. You do not cure a lesser evil by a greater. In fact, unless the Philippines should be attacked, or unless there should be a massacre of American citizens in the Orient, there is nothing whatever that should induce us to get into a war in that part of the world. Our theorists say that the Kellogg pact has made neutrality no longer possible. I do not believe it—and neither does Mr. Kellogg—but if it were true, I should rather discard the pact than give up our right to neutrality.

Japan is incomparably the strongest nation in the western Pacific. It suffers to-day under a plague of chauvinism and has suddenly, therefore, become a menace to the peace of the world. That menace can be removed only through infinite patience, by holding fast, on our part, to the friendship which began eighty years ago.

If Japan and America should permit other nations to force them into a silly and utterly useless war for any reason whatsoever the world would be set bark a generation. To hold fast to our friendship with Japan is not to desert China. Rather should it help to bring China and Japan together. And until those two nations, one splendid through its traditions, its size, its potential power, although now utterly disorganized; the other splendid through its patriotism, its nervous force, its vigor in action, although now that action seems often misdirected—until these two nations come together there can be no assured peace in the Orient.

Valuable New Atlas of China is Issued

ONE of the most valuable books of reference that has lately appeared is The China Provincial Atlas and Geography, which has been brought out by *The North-China Daily News and Herald, Limited.* It is a cloth bound volume, 10½ by 12½ inches, and in its sixty pages it presents maps of every province in China accompanied by descriptive matter and many well-chosen illustrations. The work has special value for all those who wish to keep pace with the changes that have been taking place in China in recent years.

The information presented in the new Atlas has been systematized and simplified in a most practical manner. The eighteen provinces, generally referred to as China Proper, have been taken together in the work and the four provinces of Manchoukuo are given as a single map. These with the lesser known boundary territories complete the Atlas in which are twenty-three maps in all. In recent years several of the provinces and many of the principal towns and cities have had their names changed. In the Atlas the old names are given first as these still are commonly used, but the new names are given alongside the old in brackets. Special articles in the work deal with climate and the distribution of flora and fauna of China, and in addition to comprehensive descriptions of every province including Manchuria, a special section is devoted to the Port of Shanghai.

From the index of the new work giving more than a thousand references it is seen that the volume is as much a handbook as an atlas, for subjects that are dealt with include, "Areas and Population," "Railways and Rivers," "Highways and Mountains," "Flora and Fauna," "Industries and Products," "Language and Types," "Climate and Weather," "Foreign Representation," and the special section on Shanghai. For the student of Chinese affairs the book is invaluable and its cost, $6, is considerably less than might be reasonably charged for a book dealing only with a single one of the many features it covers.

The Future of Shanghai*

By O. M. GREEN (Late Editor "North-China Daily News")

Among many questions that must vitally affect China's future relationships with the West, none is more important than the destiny of Shanghai; nor is any Power so well fitted as ourselves to take the lead in its determining. The foreign settlement, when Shanghai was opened to trade in 1843, was at first an area set aside for British residence (though others were swift to push in and glean where we had opened the way); the immense development and good administration of Shanghai are admittedly due to British guidance in subsequent years; in spite of competition, our interests there are still much greater than those of anyone else; and, without conceit, it may be said that both China and certainly European nations still look to us to take the lead in great international matters of the Far East.

For those unfamiliar with local conditions, the question of Shanghai may perhaps best be understood by means of a simile. Suppose, let us say, Southampton were owned and entirely controlled by fifty or sixty thousand foreigners, further inhabited by about a million Englishmen, but the British Government had no authority within its circle and could not send a single policeman into its area to execute its orders even among the resident English. Suppose also that, while the rest of Great Britain had been a prey to civil war and anarchy, Southampton had grown to be the wealthiest city in the country, the center and guardian of all its finance, commerce, and industry, until the strange paradox had arisen that the stability of Southampton, under its foreign control, was even more vital to the British as a whole than to its foreign owners; and lastly, suppose that an English nationalist party had arisen, which declared that they must be masters in their own house (Southampton included) and that others sympathized with them, yet felt that great caution must be used in meeting their aspirations, lest more harm might be done to England as a whole than good: there, *mutatis mutandis,* is the issue of Shanghai between Chinese and foreigners.

One further point must be stressed. Just two years ago, owing to the peculiar position and imperfect powers of its Administration, Shanghai was caught in a frightful conflict between China and a foreign Power, in which it might easily have been wiped out, as in fact large parts of it were. Nothing whatever has been done to remedy the imperfections which were the direct cause of that catastrophe. "Feeling," as we say, is better. But all the old inflammable materials are lying about awaiting some possible new spark to start another holocaust. No attempt has been made to sweep them away and substitute more fire-proof foundations for the enormously important organism that Shanghai has become both to foreigners and Chinese.

The Story of Shanghai

To show how Shanghai has attained its unique position, and to make the problems of to-day intelligible, a brief retrospect is necessary. When Shanghai was opened to foreign trade, the Chinese officials allotted a stretch of land on the riverbank, northwards of the old native city, whereon the traders were to be free to acquire land, build their houses, and manage their own affairs by their extraterritorial rights and under their consuls. By 1854 the community had grown to such an extent that a Municipal Council was created, annually elected by the ratepayers, with the right to impose taxation and maintain a police force—the essential features of self-responsive government. Since then the consuls have never taken any share in the administration of Shanghai. Not the least extraordinary feature in the settlement's constitution is that, although it is under the protection of the Powers, it does not belong to them, nor can they jointly or individually give any orders to the Council (I am speaking of the International Settlement throughout; the French decided in 1863 to administer their section as a separate Concession, when the British and American Concessions were amalgamated into the International Settlement: of course, both sections work in close co-operation, though administratively they are distinct). The Council's charter to govern is the so-called Land Regulations, first drawn up in 1854 and revised in 1866, but never again since then. It is easily imagined that many of to-day's difficulties are due to the very natural inability of the draftsmen of 1866 to foresee what Shanghai has since become.

During the Taiping Rebellion, in the fifties and sixties, thousands of Chinese took refuge in the settlements and, under the benefits of foreign protection, the Chinese community inside the foreign settlements has continued to grow until to-day it numbers nearly 1,000,000. The foreign community amounts to about 50,000, made up of forty-six nationalities and others whom the census, unable to identify them, describes as "sundries." This Chinese population, never intended when the ground was first reserved for foreigners, is the cause both of the growth of the Council's powers in the past and of its perplexities to-day.

First, a court was needed in which to try Chinese cases, as the practice of sending them to the native city soon proved really unworkable; and thus the Mixed Court came into existence, with Chinese magistrates and foreign assessors sitting together.

Then it was obviously unfair that Chinese in the settlement should pay double taxes to the Council and their own officials. Moreover, it was found that the yamên runners (Chinese officials' emissaries) were mercilessly "squeezing" Chinese who lived in the settlements. The Council, therefore, claimed and eventually obtained the right to exclude the runners and preserve the Chinese under their control from the double impost.

For similar reasons, it was further agreed that no Chinese official proclamations could be posted in the settlement; also that no Chinese could be arrested and taken out of the settlement without a proper charge and a *prima facie* case made out against him in the Mixed Court, the warrant for his arrest being executed by the Council's police. It may be said that this safeguard against political terrorism or financial extortion by Chinese politicians and officials has been proved absolutely necessary again and again.

Administrative Problems

If the extension of the Council's powers seems excessive—and it has undoubtedly been great—two countervailing facts must be clearly remembered. First, the Council is the sole authority responsible for law and order in the settlement; they could not tolerate interference in their domain which might easily breed a riot. Sir Frederick Bruce, an early British Minister in Peking, with that sublime indifference for realities which the remoteness of Legation Quarter from Shanghai has so often produced, wrote on one occasion that it was no part of the foreigner's duty to protect Chinese from their own officials. Theoretically true, no doubt; yet in fact that is precisely what the Council had to do—in the general interest they could not do otherwise. And this obligation has grown ever more pressing, as all the centers of Chinese wealth have gradually been gathering in Shanghai, and, in the recent years of chaos and civil war, it has been the one place where Chinese business and finance could be pursued without let or hindrance.

In the second place, while the Council are an elective body, responsible at every step for all they do and all they spend to the ratepayers; moreover, able to be sued by any ratepayer in a court set up by the consuls, the surrounding Chinese Government is wholly arbitrary, responsible only to itself, beyond reach of any litigant. In such circumstances, as Mr. Justice Feetham has well pointed out, the elected Government must protect itself by all available means against the arbitrary, or it will be swallowed up by it, by a sort of constitutional Gresham's Law. Since 1916 the Chinese districts surrounding Shanghai have begun to develop a form of municipal government, and in 1927 they were amalgamated into one "Greater Shanghai" (containing well over 2,000,000 people, attracted by the growing wealth of the port) under a mayor. Now by common accord the present mayor,

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* *The Asiatic Review*

General Wu Teh-chen, is a most high-minded, public-spirited official, between whom and the foreign authorities relationships are very cordial. Furthermore, the administration of Greater Shanghai has developed considerably in recent years. Yet the plain fact remains that both municipality and mayor do not, in any real degree, correspond with our sense of the word. Neither of them is amenable in any respect to the ratepayers from whom they collect taxes. They are responsible only to a distant Government and, from the ratepayers' point of view, are absolutely autocratic.

This point is to be emphasized very particularly, because the day is coming when the Chinese will argue that their municipality is as good as the foreigners', and therefore the latter must be merged in theirs. A new civic center has lately been built in the country north of Shanghai, with elaborate offices, and a huge scheme of avenues and parks radiating from this center. There is no practical doubt that the ultimate intention is to produce something in imitation of foreign municipalities so outwardly imposing that the Powers may be cajoled into agreeing to the merging of the foreign area into the Chinese. But the insuperable barrier (or so it ought to be) remains that the Chinese municipality is a purely arbitrary government, subject to no law but its own pleasure; and, until that system gives place to a genuinely representative government, no alteration of the present status of the foreign settlements could be allowed without grave danger to China's prosperity as well as the foreigner's. The fact that the present mayor and the people under him are good fellows counts for nothing. They might be superseded at any moment; and it is still, unfortunately, beyond power of prediction who might remove them or who might be put in their place.

One example may be given of the uncertainties against which the foreigner must guard himself. Several months ago the Chinese Government promulgated a law for the registration of all companies. Nothing, on the face of it, unreasonable in that. Most countries do the like. But the Chinese law conferred upon officials the powers of very inquisitors. The most searching revelations of their business, such as no firm could reasonably be asked for, were demanded; and Chinese officials were not only empowered to enter business premises whenever they pleased and demand any information, but even to remove the firm's books and keep them for investigation. The dispute that has naturally arisen over the proposed registration is still unsettled.

With the growth of Nationalist sentiment in China during the past ten years, it is not surprising that the mere existence of Shanghai under foreign control has become an increasing grievance to the "politically minded." Its enormous wealth (British interests alone in Shanghai are very conservatively estimated at £100,000,000, probably they are much more) is a continual temptation to the large predatory class who have looted their own cities pretty thoroughly and hunger for the vastly richer spoils of Shanghai. To the better class, its admirable government and the rule of law it has maintained through all the years of surrounding lawlessness and slipshod inefficiency are a continual reproach. In 1926 Marshal Sun Chuan-fang, the last and ablest of the old Tuchuns of Nanking, said publicly that he was ashamed, every time he passed in his car from foreign into Chinese Shanghai, "to contrast their efficiency with our inefficiency." No other Chinese has had the frankness to speak out in this manner, but many must have had the same miserable feeling.

Obstacles in Government

The result has been a series of petty obstructions and encroachments on the Council's authority, which do not materially advance the Nationalist cause and certainly damage the interests of the masses of the Chinese population. All sorts of petty political organizations have sprung up, nominally champions of "popular rights," actually for the most part in the hands of the least worthy of the citizens; and such is the power of the tail to wag the dog in China, that the Chinese officials are not infrequently stopped from coming to agreement with the foreign Council on some measure which they know to be for the general good, simply from fear of the clamor raised by irresponsible bodies. Three examples may be mentioned.

By agreements with the Powers in 1926 and 1930, the functions of the old assessors in the mixed court have been whittled away until now the Chinese judges sit alone, the only foreign check on the court's management being that the Council furnish its police, who execute its warrants. In the boycott of Japanese, in the autumn of 1931 (following the quarrel in Manchuria), many boycott agents and anti-Japanese rioters were brought before the court, but the Chinese judges either would not or dared not convict them. The Council were thus unable to keep order, and, as all the world knows, the Japanese eventually lost patience and invaded the Chinese district, in order to do what the judges would not do, with the result of six weeks' furious fighting and the destruction of vast quantities of valuable property. Calmer days have ensued. But it is the simple truth that nothing has been done to prevent a recurrence of the same trouble. Under similar conditions, exactly similar disasters might recur.

Next the question of factory inspection. Since 1925 the Council have been trying to impose regulations on child labor in the mills, but these broke down because, of the 118 big mills in the Shanghai area, considerably over a hundred are outside the settlement and the Chinese would not co-operate. In February last year there was a shocking explosion, with over eighty deaths, in a Chinese rubber factory in the eastern district of Shanghai, and the Council decided to amend their licensing by-law so as to enable them to enforce safety and hygienic precautions. The measure was approved by the ratepayers and by the Consular Body (whose sanction to changes in the by-laws is necessary). But the Chinese officials refused to agree. They declared the Council's proposals to be *ultra vires*, and, having recently promulgated a Factory Law themselves (which, by the way, is so highly idealistic that it would not be workable in any country in the world), they demanded that their inspectors should be admitted to the settlement to supervise all factories and industries. The Council could not give this permission even if they would, because foreign-owned industries are protected by extraterritorial rights and would quite legally shut their doors against the Chinese inspectors. That, of course, they could not do against the Council's inspectors, if the by-law amendment had become operative. Thus, for want of a little reasonableness, much-needed reforms and precautions for general security remain wanting.

Lastly, the very complicated question of what are called the outside roads. To put this matter as briefly as possible, the Council have from time to time for many years bought land (as by the Land Regulations they are entitled to do) outside the settlement for the construction of roads. Since the beginning of this century—with the increase of population, the tendency of foreigners to seek homes in the country, and the multiplication of industries—more and more roads outside the settlement have thus been built to the total extent of a little over forty-nine miles. Necessities of hygiene, light, water, and policing extended the Council's activities along these roads. For many years the Chinese raised no objection, but latterly, under the impetus of Nationalist sentiment, they have begun to claim the right to police the outside roads themselves and to supply the public services along them. The result has been much clashing of authority and several "incidents," always unpleasant, sometimes much worse.

The question is undeniably difficult. The roads are admittedly Council property, and are much appreciated by ordinary Chinese living alongside them, particularly landowners whose property has increased in value. On the other hand, one cannot deny some justice in the Chinese contention that the Council's police have no more right outside settlement limits than Chinese police are permitted inside them.

Eventually, in 1932, representatives of the Chinese and foreign municipalities met in conference and were on the point of arriving at a very fair working arrangement, to share the control of the roads between them, when, at the last moment it is said, and there is every reason to believe, that the Japanese claimed special rights in the projected arrangement, owing to the number of their people living outside the settlement. In the prevailing temper of the Chinese this was quite enough to hold up the proposed compromise indefinitely. It is reported that discussions have been resumed and one may well wish them success. But the incident is noteworthy in more than one way.

Also a Japanese "Question"

It cannot be concealed that there is now a Japanese as well as a Chinese "question" in Shanghai. The Japanese community numbers over 20,000 (the British, which is the next largest, is about 13,000) and their interests in industry, commerce, and shipping are very large. The upheaval of 1932 led them to look narrowly to their position, and, seeking backwards, they had no difficulty in attributing their misfortunes to the sentimental policy of England and America which, as it seemed to the Japanese, had merely aggravated the Chinese Nationalists' arrogance and high-handedness. They have built or are building barracks in Hongkew (the quarter chiefly occupied by Japanese) capable of housing 3,000 men ; last New Year's day there was a review in Hongkew Park of 2,000 Japanese soldiers, sailors, and marines ; they are building their own fire stations, the district is policed by Japanese, and all the Japanese cafés, cinemas, tea gardens, beer halls, etc., are licensed by their own national authorities. Hongkew really begins to constitute an *imperium in imperio*, with duplication of authority and inevitable dislocation of the Council's control. This is a much more serious matter than it is possible to explain in the space at command, its seriousness being accentuated by the teeming numbers of Chinese in Hongkew, who would quickly rebel against any substitution of Japanese for Council control, with reactions that would embroil the whole settlement.

Here, then, are great matters vitally affecting the welfare of what is perhaps the wealthiest, most active city of all Asia, not even excluding Bombay and Calcutta ; nor, under present conditions, is there any visible limit to other equally irritating controversies that might be added to them. The futility of trying to grapple with each problem as it arises ; the utter wastefulness and harm to the general good arising from the recent pull-devil pull-baker relations between foreign and Chinese authorities ; the urgent need of fundamental reformation and of laying down such a constitution for Shanghai as would ensure its natural development on the lines it ought to follow : all these were frankly recognized by the Municipal Council when in 1930 they invited Mr. Justice Feetham from South Africa to draw up recommendations for Shanghai's future government, such as should meet the Chinese aspirations compatibly with due preservations of the vast interests centered in the city.

Mr. Justice Feetham's report, running in all to over 730 pages, is unquestionably a most broadminded and statesmanlike document. To deal with it in detail is obviously impossible here, but the following main points epitomize his conclusions.

(1) That the Chinese desire to be masters in their own country is perfectly natural, and that the foreign settlements of Shanghai are an anomaly which no sovereign State could be expected indefinitely to tolerate (few people would dissent from this view).

(2) That nevertheless Shanghai has grown to be what it is purely through foreign control and the rule of law thereby assured.

(3) That it would be impossible to hand over the settlements to the arbitrary rule that prevails elsewhere in China without risk of the gravest injury to China's material interests as well as to foreign nations'. The Powers, says Mr. Justice Feetham, are trustees to China for the great heritage built up in Shanghai, and would be false to their trusteeship if they relinquished control of it without most careful consideration and assurance as to its future.

(4) That Shanghai should be used as a training ground to educate the Chinese in municipal and representative government, of which they have no experience, by increasingly admitting them to share in the administration of the settlement, down to the time and the point at which the transition desired by China could safely be effected.

The methods by which (4) is to be attained are carefully planned in detail, and it may be added that for some years past the Council have actually been working on the proposed lines.

Considering that Mr. Justice Feetham's mission to Shanghai was benevolently viewed by the Great Powers beforehand, that Shanghai is admittedly a "world problem," and that his scheme is the only attempt ever made to find a solution for it—an attempt doubtless open to criticism, but nevertheless affording an admirable basis for discussion—it is extraordinary that no attempt should have been made to give it effect, or at least to examine it officially. Our own Foreign Office quite deliberately cold-shouldered it. The question of Shanghai remains where it did, only with some fresh complications added thereto.

On February 29, 1932, the League of Nations adopted a resolution which alluded vaguely to a future "Round-Table Conference" on Shanghai. It is not absolutely clear whether the League was thinking of the Sino-Japanese conflict then raging, or of the whole future of Shanghai. But there can be no question that such a conference is urgently needed, and indeed there is no other means by which Shanghai's constitution can legally be altered, except by joint unanimous agreement between China and the Treaty Powers.

But one proviso must be emphasized. Shanghai is a town in which a vast number of foreigners and Chinese have lived and worked and played together, in the main on very friendly terms, and, in recent years, with increasing appreciation of their common interests in the welfare of the great city. When the conference meets, it must not think particularly of a Chinese question, a foreign, or a Japanese, but of a question affecting all together, of a heritage in which all can share alike, with the resolve and certainty of making it ever greater and more splendid.

Poverty, China's Capital Problem*

By CHARLES C. L. WU

RECENTLY we have been told by Japanese statesmen that Japan, and only Japan, really knows China's ailments. They regard diagnosis by European Powers as necessarily faulty. They hardly consider whether we Chinese are in a position to know our own difficulties. Prompted by the virtue of "Know Thyself," let us introspect.

Chinese students generally agree that poverty, sickness, ignorance, and selfishness are four enemies of China for they, in turn, give rise to thousand and one social problems. It is my contention, however, that out of these only poverty is the real obstacle to our progress.

Mortal sinners are not entirely responsible for China's dire poverty ; Nature, by his stingy gifts, has at least handicapped us for a fair start. Possessed of 4,278,000 square miles of land, China has been traditionally considered as a land of plenty. But after close analysis one will find that sixty-five per cent of the vast territory is located above an altitude of three thousand feet ; thus only thirty-five per cent of the land is really good for agriculture. Again, rainfall is by no means plenty ; half of our territory receives less than 20 inches per year, or the minimum amount for reasonable crop yields. On account of monsoon season, the direction of the rain comes from the south-east, leaving the vast area of the north-west necessarily a semi-arid region. This handicap has brought such misery to the people in the north-west, especially in recent years, that even our dormant government is forced to be busy with their relief.

The material prosperity of any nation is directly dependent upon its natural resources. The industrial development is strictly conditioned upon the presence in accessible regions of the basic materials. At the present stage of industrial technique, resources of coal still form the key to prosperity. China's coal reserves, taken at the lowest estimate of 40,000,000,000 tons, would be quite ample for some generations to come. However, our coal fields are mainly concentrated in the mountainous north-western and south-western corners of the country, remote from water transportation and removed from the centers of population and other basic metallic deposits. This greatly reduces much of the value of these enormous reserves.

To a manufacturing nation in the making, iron resources are of fundamental importance. According to the Chinese Geological

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*The China Critic

Survey the reserves of iron ores amount approximately to 1,000,000,000 tons with an iron content of 365,000,000 tons. This is equal to less than one ton of iron *per capita*. If used at the same *per capita* rate as the United States, China's supply of ore would last only three to four years. Moreover, an appreciable proportion of the iron ores in China is found in Manchuria. Even before the Japanese occupation, these deposits were largely controlled and exploited by the Japanese. With things as they are now, these valuable resources are practically gone for good. As most types of heavy industry consume great quantities of iron, its absence precludes the prospect that China will ever become a serious factor in the world trade in most types of manufactured goods.

The non-ferrous metals like copper, silver, gold, lead and zinc are all limited in supply. In no case have the copper mines been successfully operated, and the production is almost negligible. Silver in China is mostly associated with lead deposits and is merely obtained as a by-product. The total production is probably not over 20,000 ounces, though China ranks second, as the consumer of silver in the world. The gold deposits are mainly confined to the far north, near the Siberian border of Manchuria and Outer Mongolia. The total annual yield is recently placed at 92,000 taels. With Manchuria under Japanese occupation, the production is at least reduced by half. Tibet is supposed to contain gold, but no careful survey has been made. Granting there are gold deposits, the inaccessibility of the region and the complicated political situation would render the development very difficult.

Of course, China is not destitute of all natural resources. In tin, antimony, tungsten, etc. China has sufficient quantity for any expansion which is likely to take place for some decades or even centuries. But all of these, we must remember, are minor minerals which do not exert sufficient influence on a nation's prosperity. Discussing the same topic, Mr. Cressey says in his recent book, " The great accumulation of wealth in the advanced countries of the West during the past century has been largely due to the unlocking of buried mineral treasures. The available power per person in the United States is now probably one hundred and fifty times that of China, while the average *per capita* wealth is something like five hundred times as great. Various factors of race, environment and history enter into this contrast ; but in so far as it depends upon the presence of natural resources, it does not appear likely that a China of 485,000,000 people can attain a similar standard."

With such scanty natural gifts to start with, China certainly has a difficult task to keep abreast with her more fortunate cousins in modern adventures. If, however, China could have a sparse population, say, one-fourth to one-third of the present one, she might be able to get along fairly well even with a poor supply of natural resources. On the contrary, she has an enormous population to support. China is analogous to a family of too many children living on a none too rich inheritance.

China's population is variously estimated between 300,000,000 to 500,000,000. If we take rather conservative estimate of 450,000,000 and the total area of 4,278,000 square miles, the average density of population is thus 105 persons per square mile. On the surface this average is much lower than that in many European countries. But we must remember, the topographic and climatic limitations mentioned above. Broadly speaking, 83 per cent of China's population is thickly compressed in 17 per cent of her territory. The remaining 83 per cent of the territory, even when fully utilized, can never support a large population. If we take the cultivated area as our basis of our calculation, we have for the whole country an average of 1,405 persons per square mile. This high average is only surpassed by Netherlands, Switzerland, England, and Japan. If we take the provinces south of Yangtze Kiang, we have an average of 2,108 per square mile and if we take Kwangtung province alone the figure runs even as high as 3,011. Such averages easily put China way ahead of the most densely populated countries of the world, as Netherlands and Switzerland have only 2,108 and 2,107 per square mile of cultivated land respectively. Such a teeming population living on a rather limited area, small wonder it is that most of the people can hardly make even a mere existence !

The dire poverty can be proved from another angle. As China is *par excellence* an agricultural nation, her prosperity naturally depends mainly upon the amount of *per capita* cultivated land. Owing to the lack of reliable statistics, various estimates have been given by different authors. Baker calculated at four mow for Hopei, three mow for Shantung, 2.5 mow for Kiangsu and 1.5 mow for Kwangtung, etc. In the estimate of Voline, 50 per cent of the total population possess only land of 0.36-7.00 mow *per capita*. A recent official estimate by the Bureau of Statistics places 13 mow per farming family for Chekiang, 18 mow for Kiangsu and 21 mow for Hopei. According to C. C. Chang's estimate among the six main divisions of the country, the food crop area ranges from 2.05 mow to 4.90 mow *per capita*, and he estimates the average for the whole country at 2.98 mow. If each person needs 350 catties of food per year and each mow on the average can yield around 200 catties in average years, we can readily see, a large portion of the Chinese farmers, after paying taxes and rentals, cannot get enough food even in ordinary times.

This is bad enough. From various recent studies we learn that China's population is definitely growing. Her birth-rate is around 38 and her death-rate around 26. Using Raymond Pearl's formula (birth rate divided by the death rate times 100) we have a vital index of 148. When the index is above 100, it is a growing population. Studies have also shown that the proportion of population under 15 years of age constitutes 32 per cent of the total population. It is calculated that when this age group is over 30 per cent, the population is of a progressive type, that is, a growing population. With such an actual and potential increase ever present, we can very well look forward to the day when the population figure will roll well over 500,000,000 or even 600,000,000.

With inadequacy of natural resources on the one hand and undue increase of population on the other, China is doomed to remain poverty-stricken. It is difficult to say at present what percentage of the Chinese people is below the poverty line, for poverty-line is a relative term. If we take it to mean a kind of living which falls short of the following criteria, perhaps we may be able to venture an estimate.

To be above the poverty line, a person in the first place must have sufficient food to keep the body in good health. Then he must have sufficient clothing according to the current standard of decency. We do not expect him to wear silk or woollen stuff ; we only want him to be sufficiently warm in winter and cool in summer. His living quarters should be big enough to contain a proper amount of air space necessary for human breathing and clean enough for a civilized man of the twentieth century to work in. Then as a member of society he should see to it that he has done his duty in racial perpetuation. So, another criterion demands him that he should be financially able to marry at a reasonably early age and financially able to rear three to four children till they, in turn, can start their own independent life. Then we must not forget that man is not like machine or animal ; he should have some leisure to enable him to enjoy and appreciate the fruits of milleniums of human civilization. Lastly, he should be provided with funds to meet such contingencies as sickness and accidents, not to mention old age.

Critics may consider this proposal as far too high for the ordinary Chinese. Perhaps it is. But if they keep in mind that this is the twentieth century, and China, as every Chinese admits, is a civilized country, they will perhaps agree with the proposed criterion. On the basis of such a criterion, are we too far from truth to say that at least over 95 per cent or perhaps as high as 98 per cent of the Chinese population would fall below the poverty line ?

Poverty breeds sickness, ignorance, and selfishness. I do not mean that when poverty is ameliorated other social evils will go with them. No, they will still remain, but their magnitude will certainly be lessened. Therefore it is my contention that China's paramount problem is how to alleviate the dire poverty born of scanty natural resources on the one hand and population pressure on the other.

Manchoukuo Air Routes

The striking development of aviation in Manchoukuo is reflected in the announcement that air routes in the country now total 2,300 kilometers. During 1933, the aggregate hours of flight were returned at 18,000 hours and the total mileage at 2,700,000 kilometers. Cargoes carried weighed 240,000 kilograms and mail matters at 64,000 kilograms.

For the last one month, flight hours totalled 1,600 over an aggregate distance of 300,000 kilometers. It is reported that Manchoukuo authorities propose to establish connections with regular air services in Japan and Soviet Russia during this year.

The Resurrection of A Nation

How Japan and Manchoukuo Have Saved the Mongols from Utter Destruction

By ELLIS WHITMAN

The resurrection of the Mongol nation, only a few years ago facing utter destruction and extinction at the hands of Chinese officials, soldiers, and bandits, is one of the brightest pages in the history of the years which have seen the establishment of the state of Manchoukuo, with the Mongols in a separate and autonomous province—far the largest province in the new state. The Mongols of Manchoukuo number over two millions, and there is another million in Inner Mongolia still under Chinese sovereignty but now in a position to demand complete self-government and the end of Chinese aggression. Twenty years of unchecked oppression and plunder of the Mongol people, under the Chinese "Republic," have been brought to an end by the establishment of Manchoukuo with Japanese assistance. The effects have been felt over all of Mongolia—an enormous territory covering more than a million and a quarter square miles, as great as all western Europe, and with a population comparable in numbers to that of Australia.

The Mongols, as a whole, were never conquered by the Chinese. A peculiar combination of circumstances made most of them, for twenty years after the abdication of the Manchus, subjects of the Chinese. The Mongols had been allies of the Manchus, co-operating with them in the maintenance of the Empire, but when the revolution came and Chinese warlords supplanted the Manchus, the "Republic" did not relinquish the Mongol areas of the Empire, but held them forcibly,—excepting for Outer Mongolia, which broke away with Russian assistance. A policy of unchecked and ruthless aggression followed—Imperialism in the worst possible form,—made possible by the fact that the Chinese "Republic" fell heir to the Manchu Government machinery by which the Mongols had been kept as allies but under the ultimate control of the Empire, and further by the fact that the Chinese warlords could obtain modern arms which were inaccessible to the Mongols, with their inland position, and penetrate into Mongol territory by the new railways which were built to serve Chinese Imperialist purposes.

With all this, however, the mass of the Mongols remained Mongols in speech, culture, and national consciousness, and even when taking up agriculture resisted the process of China-fication forced upon them by their new masters—masters who had once been their subjects. The tradition was still strong among them of the centuries when the Mongols had come to China as raiders and rulers, had established Chinese states, at one time had ruled not only China, but western and southern Asia, and all eastern Europe as well, under Jenghis Khan, Emperor of All Men, from whom all ruling Mongol princes of to-day claim direct descent.

Khan Wished to Adopt Christianity

Kublai Khan, grandson of Jenghis, founded the Yuan Dyansty of China, and made Peking its splendid capital, so glowingly described by Marco Polo. This great Khan desired to convert his people to Christianity, an attempt which if successful might have had incalculable effects upon history, but the Roman Church, at the time Kublai sent his mission asking for a hundred Christian priests to teach the religion, was engaged in one of its bitter internal disputes, and for a time the request was practically ignored. Two monks were finally sent for this great missionary task of converting the dominant people of the world's mightiest and wealthiest empire, but the two had no stomach for the risks and discomforts of the trip, and turned back before even reaching Central Asia. After waiting in vain for many years, the Khan turned to Lama Buddhism as the "next best thing," and in response to his request the Tibetan lamas showed a most zealous missionary response, and converted the Mongols to Lama Buddhism—a faith which they have retained to this day.

The Mongol tribesmen who had developed their virile and combative powers in the free life of the Mongolian plains could not but degenerate with generations of life in the position of rulers in China, while at the same time there was continued division among the tribes, the Mongol ruling class of China losing the support of most of their free-riding, free-living compatriots beyond the Wall. The Dynasty fell, and some of the Mongols adjacent to China were at times forced to accept Chinese overlordship or to pay tribute to China, though this was usually accomplished by diplomatic intervention by the Chinese between the various tribes, and by supporting one tribe against another, rather than by actual conquest. Chinese historians noted as a great event in history the conquest of the Outer Mongols, beyond the desert, by the great Ming Emperor, Yung Lo, in 1422—the only time in history, prior to the Revolution, that the Chinese claimed rulership over all the Mongols,—but how short-lived a conquest this was is shown by the fact that in 1449, twenty-seven years later, Mongols from Suiyuan, close to the Wall, were raiding Chinese territory to the north of Peking, and approaching the capital itself.

Manchus Ally with Mongols

The great territory which later came to be known as Manchuria, and now as Manchoukuo, was about half Mongol—the western half, excepting the zone of Chinese colonization in the south, being occupied by Mongol tribes. The Manchus, extending their power from the east in the seventeenth century, early reached an alliance with Inner Mongolian tribes. Manchu and Mongol Banners, as well as Chinese Banners from southern Manchuria, co-operated in the conquest of China. The Manchus were dominant, and held dynastic power, but a number of their princesses were given to Mongol princes in marriage, and Manchu, Mongol, and (Manchurian) Chinese Bannermen shared Imperial privileges. Later the Outer Mongols proffered homage to the Empire in exchange for much-needed assistance against the powerful Eleuth or Kalmuck tribes (who were also Mongols) further west. Later the Eleuths themselves were brought into the Empire, and for the second time Mongolia and China were united under a single Empire, though the Mongols were no longer complete masters of China, but allies and supporters of a new Dynasty whose privileges they shared.

Though Chinese colonization, and intermarriage with the Mongols, was forbidden, there was in fact some development of Chinese farming in the Mongol areas closest to Chinese-settled districts. The princes in such areas increased their agricultural food supplies and their revenues by letting out some of their lands to Chinese farmers, or by taking up agriculture themselves with Chinese as farm-hands. The "colonized" and agricultural area beyond the Wall increased, therefore, but with the Mongols as beneficiaries, and many Mongols themselves turned to agriculture in these districts. In the latter part of the nineteenth century the Imperial ban on Chinese emigration and colonization beyond the Wall was revoked, and Imperial officials obtained a share of the revenue from sales of Mongol lands. Early in the present century emigration began to be increasingly stimulated by the opening up of railways, which make it possible for farm products to reach more distant markets.

Outer Mongolia Breaks Away

Russian expansion in the north came as a serious threat to the Empire's control of Outer Mongolia, especially after the Russians had been driven out of South Manchuria by the Japanese and began to devote more attention to Mongolia. The Peking Government had lost one outlying dependency after another owing to the looseness of its rule over these practically self-governing vassal states, and now took steps to tighten up control in Outer Mongolia, sending Chinese troops there, levying taxes, and endeavoring to introduce a measure of direct administration. All these steps were strongly resented by the Outer Mongols, who had been self-governing, and virtually independent in all internal affairs, prior to that time. The Russians, for their own Imperial interests, encouraged the Outer Mongols in their resistance, and when the latter sent a delegation to the Czar to appeal for aid, Russia sent a note to Peking stating that the new measures taken by the Imperial authorities in Outer Mongolia violated the agreement by which the Mongols had come under Chinese sovereignty, and declaring that Russia, as Mongolia's neighbor, "could not be indifferent to any violent change in the *status quo* of that territory."

The abdication of the Manchus, however, automatically severed the Mongol tie with China, and the Outer Mongols expelled the Chinese Resident, declared their independence, and chose the "Living Buddha" at Urga as Great Khan of the Mongols. This movement seemed destined to include all Mongolia, but there were some areas close to the Wall where the princes had become powerful and wealthy landlords, with both Chinese and Mongol agriculturists, and closely involved with the Peking Government. Some of these landlord-princes found it to their interest to serve the Peking Government even after the abdication of the Manchus, and their influence was of importance in preventing the movement for Mongol independence from embracing all Mongolia.

Several other factors were also of importance. The Peking Government had as far back as the eighteenth century, in order to prevent any Mongol threat to their control, extended the Imperial province of Chihli far north of the Wall, to considerably beyond Dolonor and reaching the Shara Muren. The new Chinese Government in 1912 was able to take over the administrative machinery in this area, with the co-operation of certain Mongol princes above referred to. Also, they were able to take over the administrative control in the areas of eastern Inner Mongolia which had been incorporated in Fengtien and Heilungkiang provinces, as well as in the Mongol districts beyond the Wall in Shansi, while the organs of military supervision and control which the Empire had maintained in more outlying parts of Mongolia were also of value to the new régime.

Foreign Arms Aid Chinese Aggression Against Mongols

These elements were backed up by a new factor—Chinese superiority in arms. The new foreign armaments, imported from abroad, gave Chinese armies an unquestioned advantage over the Mongols. It was the swift-moving cavalry of the latter which had been their mainstay in days gone by, but cavalry could not stand against heavy guns. Furthermore, many of the Mongols, who had settled to agriculture, were no longer footloose like their herdsmen compatriots, and a number had no horses at all. These settled Mongols were at the mercy of the Chinese soldiers and bandits, and had to suffer terribly for every effort at resistance made by their fellows. The fighting power of the Mongols, therefore, was decreased, at the same time as that of the Chinese, traditionally inferior in war, was greatly increased both by superior armaments and by railways, gifts from the West which were more or less inaccessible to the Mongols except via Russia.

Russia, however, limited her active assistance to the area beyond the desert—Outer Mongolia. It was Japan which prevented her establishing a protectorate—which would after the Russian revolution have become a Soviet protectorate,—over Mongolia as a whole. Two years after Japan's defeat of Russia in 1905, France recognized Japan's "special rights" in Mongolia, and Japan accordingly, in her treaty with Russia the same year (1907), recognized Russia's special position only for Outer Mongolia. Britain also (in 1911) recognized Japan's interests in Mongolia. When the Mongol revolt came, therefore, assisted by Russian arms and Russian military advisers, the Russians had to make definite conditions that these arms were to be used only for Outer Mongolia, and their support given the Mongols only for that area, not for Inner Mongolia. A Mongol force sent to occupy Inner Mongolia was completely successful against the Chinese armies—showing the *old Mongol superiority still obtained when the Mongols were supplied with modern arms*, and got almost to the Great Wall. But the refusal of Russia to support them, and the attitude of the group of Mongol princes who had shamelessly gone over to the Peking Government and who now negotiated with the Mongol leaders for withdrawal, finally obliged the Mongol forces to return to the north. Thus, thanks to Japan's interference—supported by France and Britain—was prevented a move which would have brought Russian influence to the Great Wall, and would have meant, ten years later, a Red protectorate almost at the gates of Peking.

Chinese Aggression Against Inner Mongols

In the meantime, however, the Mongols of Inner Mongolia, and of other areas still under Chinese rule, suffered. Much of eastern Inner Mongolia had already been incorporated in the provinces of Fengtien and Heilungkiang, and in 1914 the "special administrations of Jehol, Chahar, and Suiyuan areas" were formed from the old Mongol territories north of the Great Wall. The Mongols were now subjected to unparalleled and ever-increasing plunder by Chinese officials, leagued with land speculators, also by Chinese bandits, most notoriously in the provinces under Fengtien's rule. Lattimore, the American authority on Manchuria and Mongolia, in his book on "the Mongols of Manchuria," describes the process:

"Land commissioners were appointed to control the transfer of land from Mongols to Chinese, and these land commissioners, for lack of adequate funds and according to the immemorial tradition of official procedure, paid themselves chiefly out of the opportunities offered by their official positions. They allied themselves with land speculators, and became at one and the same time officials enforcing the regulations of land transfer and private investors taking up the land transferred—a practice which allowed them to take up the best lands at the cheapest prices. Having acquired huge grants at practically no cost, they were under no pressure to risk heavy capital investment in promoting settlement to develop their holdings. They could afford to wait indefinitely for unearned profits, until the spontaneous progress of colonization approached their property, enabling them to realize enormous profits on the rise in land values, without risk or cost in promoting development."

These lands were simply taken from the Mongols, regardless of law or equity, declaring the Mongol princes' land deeds invalid, and asserting as a "legal principle" that the Mongols' land belonged not to them but to the Chinese State, utilizing this principle, Lattimore points out, "for the purpose of expropriating land from the Mongols, whether or not already farmed, and preventing the Mongols from saving themselves by taking up agriculture," which the American observer notes as "a masterly example of legal chicane and historical cynicism."

Plundering the Mongols

The great "progress" of Chinese colonization in Manchuria since the Revolution has been due in large measure to the shameless plunder of the Mongols. Lattimore says: "An astonishing proportion of the 'virign prairies' colonized by the Chinese during the Manchurian expansion which appeared so miraculous to the outside world, consisted of land already cultivated by the Mongols, often for a generation or more. It was they who had developed it from virgin prairie to successful cultivation. It was land that had been Mongol for centuries. They had acquired it in private ownership by formal and regular agreement, duly paid for and registered with the officials of their own people. They were told, however, that the soil of Mongolia did not belong to the Mongols. It belonged to the Chinese nation, and title of private possession could only be granted by the Chinese Government. 'Officially,' therefore, the land which they had paid for and had been cultivating was virgin prairie and part of the public domain. They had either to buy it all over again from the land-commissioners in charge of surveying the 'wilderness,' or—get out."

The Mongols, therefore, were driven either to serfdom on their own lands, or driven off them altogether. The lands where independent Mongol tribesmen had done their farming and grazed their cattle were filled with poverty-stricken Chinese peasants, from the famine areas of North China, bound hand and foot to officials and landlords who exploited them mercilessly. As much as seventy per cent of the farm produce would have to be paid to the landlords—themselves men who had simply stolen the land, *with official collusion*, from the Mongol owners. As for the thirty per cent left the farmers, the old system of official exploitation in the Manchurian provinces is notorious,—the officials buying up the crops for steadily depreciating paper money, and selling abroad for good currency which they proceeded to deposit to their own accounts in the banks.

As for the plundered Mongols, there were desperate revolts from time to time, but these were never sufficiently widespread, or sufficiently well equipped, to be a serious menace to the Chinese advance, and the comparatively well-armed Chinese forces put down every revolt with appalling ferocity. It soon became clear, as Lattimore phrased it, that "Chinese colonization means the complete extinction of the Mongols."

The Coming of Manchoukuo

For nearly twenty years, under the "Republic," the conditions of the Inner Mongols became more and more desperate. The big land boom of 1926-28 came as a climax, with a million Chinese a year coming to Manchuria to be settled on lands largely taken from the Mongols. At the same time, even the nominal position of the Mongols as one of the "five peoples" of the "Chinese Republic" disappeared. The five-barred flag, with the Mongols represented equally with the Chinese, Manchus, Moslems, and Tibetans, was supplanted by the Kuomintang flag of Chinese Nationalism. The "special administrative districts" in Mongolian territory north of the Wall were now established as Chinese provinces, together with a new one—Ninghsia—further west. Inner Mongolia disappeared from the map. Everything indicated that the Inner Mongols themselves were destined to disappear from the map. Even where not physically exterminated, every effort was made, through the Chinese schools and every other organ of Kuomintang propaganda, to wipe out all memory of Mongol traditions, Mongol culture, even the Mongol language. Every desperate rebellion was put down mercilessly, and explained as "Mongol banditry,"—the plunderers of Mongol lands shamelessly referring to their helpless victims as "bandits." At the same time, Chinese official depredations were supplemented by the activities of unofficial Chinese bandits against the helpless Mongols.

The overthrow of the Fengtien régime, and the establishment of Manchoukuo in 1932, came as a great ray of light and hope to the Mongols. From the very beginning they did all possible in support of the new movement, which assured the Mongols of self-government in their own areas, the guarantee of their rights, and protection in the areas where they had already been swamped by Chinese immigrants. Mongol princes participated in the foundation of Manchoukuo, and when the new state was established in 1932 the Mongol areas were set aside as a special province, governed by the Mongols themselves. The terrible night of Chinese oppression was over. A new day was dawning for the Mongol people.

Autonomous Hsingan Province

Hsingan Province of Manchoukuo, the autonomous Mongol area, was far the largest of the five provinces of the new state, over six hundred miles long at its maximum from north to south, and varying from a hundred to four hundred miles in breadth,—an area greater than Italy. The predominantly Mongol districts of western Heilungkiang and Fengtien, and northern Jehol, have been incorporated in this new autonomous province, which possesses a special status, one which may be described as essentially one of alliance.

The area is divided into four districts, North Hsingan (the Barga district, west of the Hsingan mountain range), East Hsingan and South Hsingan (east of the mountain range), and West Hsingan (the predominantly Mongol districts of Jehol). Within this great area the various Mongol tribal units govern themselves. There are no non-Mongol Manchoukuo troops in the whole territory, the Mongols themselves maintaining order and security in their country.

The connection between these independent Mongol areas and the Manchoukuo central government at Hsinking is maintained through the provincial administration. This administration includes both Mongol representatives and official Manchoukuo appointees, but—it is striking to note—has no center in Hsingan province itself, which is left wholly to the Mongols. The "provincial headquarters," if they may be so termed, are at Hsinking itself, which again, says Lattimore, "is in keeping with the special standing of the Mongols, approximating to alliance. The province has no capital of its own."

Hsingan province, furthermore, is not even under the various ministries of the Manchoukuo Government. Its officials deal directly with the Privy Council. There are Japanese advisers, as elsewhere, for it must be remembered that the policy of the Mongols, however complete the independence and autonomy granted them in their internal affairs, must be co-ordinated with that of the new state as a whole, and the eastern Inner Mongols, though self-governing, are a part of the Manchoukuo Empire.

Railways

As showing how the policy in relation to the independent Mongol area is designed to serve the interests of the Mongols may be noted the railway program. Railways in the past have served to assist Chinese aggression and colonization, and though the former is now at an end, the more peaceful encroachment of Chinese peasants, making headway simply by under-living the Mongols, may still be a menace. There is no exclusion act, as in the United States and some other countries, against this menace of Chinese peasants living at sub-human standards, but a co-ordinated Mongol policy can in fact prevent their encroachment upon Mongol lands, and the lack of railways will assist in maintaining these areas intact. Two railways run through Mongol territory—the Chinese Eastern Railway in the north and the Chengchiatun-Tungliao-Changwu (Tahushan) system in the south, — but these can be controlled so as not to promote immigration. And no more are being built.

This is a striking fact, in view of the enormous amount of railway building being carried on in the other provinces of Manchoukuo at the present time. It is a fact which, it may be noted, testifies not only to the desire to serve Mongol interests and keep Hsingan as a Mongol province, but also to Japan's desire for peace. Were Japan preparing to attack Russia, as many alarmists claim, she could not overlook the tremendous strategic importance of railway communication towards Outer Mongolia, control of which area would put the Trans-Siberian line at her mercy. But not a foot of railway has been laid in this direction since the establishment of Manchoukuo.

Other Mongol Areas

There are a number of areas in Manchoukuo, formerly Mongol, where Chinese immigrants have come to outnumber the natives. There is, here, no endeavor by the Mongols to revenge themselves for the decades of persecution and extortion which they suffered, or even to expel the Chinese settlers. On the contrary, such areas as have become predominantly Chinese are permitted to remain so, and are included in the Chinese provinces of Manchoukuo. The Mongol groups in these "lost" areas, however, possess local self-government so far as they are in separate communities, and their interests are looked after by local "Mongol Bureaus," formed by or in relation to the tribal organization of these groups.

There are over two million Mongols in Manchoukuo. Their emancipation did not at once free the Inner Mongols further west, in Chahar and Suiyuan provinces. It presented, however, a new hope, a new opportunity. The Mongols of Chahar and Suiyuan turned their eyes to Manchoukuo as a promise for the future. And when the Japanese-Manchoukuo forces occupied Jehol last year, and finally the Tangku Armistice was signed, these Mongols outside of Manchoukuo were not forgotten. No attempt was made to forcibly assert Manchoukuo authority over their areas, but it was distinctly stipulated in the Tangku agreement that no Chinese forces were to enter northern Chahar. This gives the Mongols here the opportunity to determine their own allegiance, and their fellow-Mongols further west were also affected.

Chinese Aggression in Chahar Checked

The Tangku agreement, as officially announced by the Peking branch of the Military Affairs Commission, provided that the Chinese troops would withdraw beyond a line running from Lutai, near the sea, to Yenching, in Chahar a little beyond the Wall. The announcement did not refer to the extension of the line beyond Yenching, the Chinese authorities, for reasons of internal policy, not wishing to make this public, and the Japanese not desiring to embarrass them. But the Peking authorities were unable to exercise control over some of the Chinese forces, which, led by the revolutionists Fang Chen-wu and Chi Hung-chang (a movement ostensibly led by Feng Yu-hsiang until the latter's old Kuominchun troops under Sun Tien-ying appeared to be provided for, after which Feng took his departure for Taishan), advanced into northern Chahar, finally taking Dolonor, the old Mongol city near the border of Jehol, once the summer capital of Kublai Khan. These violations of the Tangku agreement finally obliged the Japanese to speak out, and the taking of Dolonor was followed by a strong protest from Colonel Shibayama, Japanese Military Attaché at Peking, who pointed out that this occupation constituted a "flagrant violation of the Sino-Japanese truce agreement," while a spokesman for the

Japanese Legation confirmed that Dolonor was included in the area beyond which Chinese troops could not go. Repeated warnings by the Japanese that they were prepared to take measures to enforce the terms of the Tangku agreement were futile, and it was finally necessary to dispatch a combined Japanese-Manchoukuo-Mongol force to drive the Chinese rebel forces out of the special zone. Sung Che-yuan's forces, however, themselves advanced to Kuyuan, obliging the Japanese to protest at Kalgan against this new violation of the agreement, and declare in unmistakable terms that Sung's troops must at once " withdraw to the west of the line stipulated in the armistice,"—i.e., west of Lungkwan and Changpeh, the latter town being in western Chahar less than forty miles north of Kalgan. It was only after this emphatic declaration that the Chinese troops finally evacuated Mongol territory in Chahar.

Colonel Shibayama had already, in response to the amazing Chinese request to turn Dolonor over to Chinese troops, made an emphatic declaration that the city had been occupied by Mongols, natives of Chahar province, hence China had no right to the city. The presence of native Mongol troops, he declared, would " stabilize" the territory in accordance with the spirit of the truce. The Chinese request, therefore, was " unthinkable."

With this emphatic statement it became clear that Chinese aggression against the Mongols, so far as northern Chahar was concerned, was at an end.

Autonomous Inner Mongolia

The Mongols of Chahar were not long in asserting their new-found freedom. It is from that time, indeed, that the demand for a Mongol autonomous régime, for the tribes in Chahar and Suiyuan, has arisen, and the Chinese officials are hardly in a position to refuse. As regards northern Chahar, Chinese aggression has definitely been checked, and Chinese forces are no longer able to enforce their will upon the Mongol populace. As regards areas further west, the Chinese fear that if self-government is any longer denied the Mongols, they will renounce Chinese sovereignty and turn to Manchoukuo. It is, therefore, not exactly a question as to whether the Chinese will " grant" autonomy to the Mongols. It is a question of whether the Mongols are willing to remain under Chinese suzerainty, in spite of their grievous mistreatment in the past. If the Chinese had refused the Mongol demand, the Mongols of Chahar were in a position to renounce Chinese suzerainty altogether and apply for inclusion in Manchoukuo. In order to placate the Chahar Mongols it was necessary not only to recognize their right to self-government, but also the same right for their fellow-Mongols of Suiyuan, the appeal having been a united one, made by Mongols of both areas.

We are seeing, therefore, in actual process, the resurrection of the Mongol people, now practically free from the Chinese yoke. Nearly half of them are in their great self-governing territory in Manchoukuo. Almost a million are further west, still under Chinese suzerainty, but accepting this only on the condition of their right to self-government, and an end to Chinese aggression, exploitation, and oppression. More than six hundred thousand are in Outer Mongolia, a Soviet protectorate but with a considerable degree of self-government. Whatever may be the future of the Mongols, in Inner and Outer Mongolia, they are no longer a helpless and dying people, faced with extermination by Chinese warlords, land thieves, and bandits. They are to-day asserting themselves as an independent people, worthy descendants of a race of conquerors. It is the creation of Manchoukuo which has made this possible, has permitted the Mongol people to raise their bowed heads and look towards a brighter destiny.

Netherlands-Nippon Trade Conference

By EISABURO KUSANO

Trade negotiations between Netherlands and Nippon were opened at Batavia early in June, 1934. The primary object of this conference is known as that of rectifying the three-to-one preponderance of trade between Dutch East Indies and Japan. That is, the primary concern of Netherlands is to make Japan buy more from its Asiatic colonial islands. It is also known, however, that the problems involved are more complicated than mere balancing of the trade. It is said that the ultimate aim of the trade restrictions, recently enforced or proposed to be exercised by the Batavia Government, is to wipe out the Japanese from the islands under its jurisdiction and to enable the Dutch merchants there to enjoy virtual monopoly of the import as well as the retail trade.

There are, in point of fact, a number of subtle factors that have jointly accounted for the request on the part of the Netherlands to convene the present Batavia conference, in addition to plain facts revealed in the international trade returns.

Included among these factors, which incidentally make clear the position of the Hague and Batavia Governments in the present issue, are the following :

(1). Necessity to restrict the increasing imports from Japan in order to reserve the D.E.I. market for other countries who are better buyers of the D.E.I. products than Japan.

(2). Protection of the domestic industries in the Netherlands as well as in D.E.I. from Japanese competition.

(3). Protection of the Dutch shipping enterprise.

(4). Protection of the Dutch merchants in D.E.I. whose business has been affected as the result of Japanese rivalry.

The Japanese Government, in the meantime, proposes to deal with pending commercial difficulties with the Netherlands and Dutch East Indies in the spirit of conciliation, as was shown in the instructions of Foreign Minister Koki Hirota, given to Ambassador Dr. Haruichi Nagaoka, head of the Japanese delegation to Batavia, previous to his departure from Tokyo on May 17. In substance, the instructions were to the following effect :

(1). In view of the long, historical trade relations Japan and the Netherlands have sustained, Japan will conduct the coming negotiations in a spirit of conciliation, willing to make the utmost sacrifice for the sake of arriving at a harmonious agreement.

(2). Pointing out the fact that Batavia's declaration in March 1934, regarding the emergency import restrictions is clearly in contradiction of the principle of freedom of trade, Japan will ask the Batavia Government to abrogate it if possible.

(3). If Batavia sincerely tries to abrogate the import restriction order, Tokyo is ready in return to make use of its authority to adjust the one-sided trade which is three to one in Japan's favor, and endeavor to equalize the balance.

(4). The Japanese Government, moreover, is ready to apply the trade protection law passed by the last session of the Diet in a way advantageous to the Dutch East Indies.

(5). As a concrete measure, Japan will give guarantee for import permits up to certain limits in important commodities like sugar, rubber, oil, and other D.E.I. products. In return, Japan will request a guarantee for import permits into the Dutch East Indies, covering cotton and rayon goods, cement, beer, knitted goods, porcelain, and other sundry commodities, preferably on the basis of the 1933 figures.

(6). Regarding the duty imposed on Java sugar, Tokyo is willing to promise a gradual lowering of the rate following increase of consumption in Japan and other countries of the Far East. Japan will then import sugar from Java in larger quantities, refine it, and possibly export it to continental Asia.

(7). According to the Batavia Government's report, the external trade of the Dutch East Indies has decreased to one-third within the past five years. This is due largely to obstructions imposed upon commodities offered at reasonable prices, such as Japanese goods, and the encouragement of the import of high priced commodities. Japan will point out the irrationality of such a policy and suggest a plan for improvement.

(8). Japan will also show that a negative trade policy tends to curtail the purchasing power of the natives, this in turn adversely affecting the Dutch East Indies trade with the Netherlands as well as other countries.

Outlined above is the position assumed by the Netherlands and the Japanese Governments in conducting the present trade negotiations.

Retrospective Survey

An outstanding feature of the Batavia Conference is that it is entirely economic factors that predominate the situation. Problems of sentiment as well as that of political nature are of secondary consideration. For the rise or fall of the Netherlands' capitalism, and also Japanese commercial welfare in the overseas markets are at stake in the present negotiations.

The Dutch Government in the Hague and Batavia has hitherto followed the policy of Open Door and Free Trade in the Dutch East Indies. Customs duties were levied on imports into these Asiatic colonial islands but it was as one of the sources of the D.E.I. Government revenue. The rates were low and there was no discrimination against any country. The D.E.I. Government concluded the treaty of commerce and navigation, including the most favored nation treatment, with other countries, and no special privileges were provided for the trade with the Netherlands. The trade with Japan was no exception. It had made smooth progress under the fair protection of the D.E.I.—Japanese treaty of commerce and navigation concluded in 1912, and the number of Japanese living in that country, too, steadily increased.

It appears, however, that the Open Door and Free Trade policy of the Netherlands is now bound to collapse, under the immense pressure of (1) the panicky developments of international trade, and (2) the sudden advance of Japanese merchandise as well as Japanese merchants to D.E.I., particularly after the tumble in the yen exchange rate. Capitalists in the Netherlands are confronted with a poignant crisis.

For the past 300 years Dutch capitalists have reaped immense profits under the principle of free trade. The Dutch commercial fleet, which monopolized the D.E.I. foreign trade in transit, has also fared well. And the Dutch overseas investments were concentrated in the Dutch East Indies. The colonial policy centered on the welfare of the D.E.I. natives coincided with that of extending the capitalistic organization of the Netherlands. So much so that up to two-thirds of the entire national wealth of the Netherlands consists of Dutch enterprises in D.E.I., and 25 per cent of the direct tax revenue of the Hague Government is borne by agricultural undertakings in the Dutch East Indies, according to an authentic estimate. In short, there is no economic and financial independence of the Netherlands without the Dutch East Indies.

The wane of the market value of agricultural products, which has resulted from the crisis in international economy, however, has dealt a severe blow to industrial activities in the Dutch East Indies where agriculture is the mainstay of industry. Subsequently, the Dutch capitalists at home, whose investments are concentrated in the Dutch East Indies, were also hard hit. Meanwhile the purchasing power of the D.E.I. natives substantially declined with the result that high priced European commodities have become beyond the reach of their purse. At this very moment Japanese manufactures were offered at low prices through Japanese merchants who were willing to do business on a smaller margin of profit. It was but a natural outcome that European commodities as well as the Dutch merchants in Dutch East Indies should be replaced by Japanese goods and Japanese merchants.

With all its prestige and dignity the Netherlands could not help but abandon the 300 year-old principle of free trade as well as the colonial policy centered on the welfare of the natives when such have come to run counter to the interests of the capitalists at home. The protective trade policy and a colonial administration centered on the interests of the Dutch people and industry at home have thus made their appearance in the Dutch East Indies. Incidentally, it happens to be disadvantageous for Japan.

D.E.I. Trade Restrictions

The Batavia importers' association, which is one of the organs representing the interests of the Dutch capitalists at home, filed a petition with the D.E.I. Government in protest against Japanese commercial activity.

This petition, while it describes in full their position, reveals also the ultimate object of their present campaign, which is to exclude the Japanese from the Dutch East Indies.

It points out that European importers as well as the Chinese middlemen in the D.E.I. are forced to retreat as the result of Japanese competition. The Japanese, who had hitherto handled commodities that were primarily imported for the natives, have now begun handling high grade articles designed for the local European residents. Moreover, their imports into and exports from D.E.I. are conducted exclusively through Japanese shipping, insurance, warehousing, and financing organs. That is, the Japanese are gradually monopolizing the intermediary enterprises between the producers and the consumers in the Japan and D.E.I. trade, at the cost of the Dutch and Chinese middlemen.

The petition warns that if the present Japanese trade organization in the Dutch East Indies is permitted to strengthen the foundation it has already built, its effect would assume signficance of more than purely economic nature. Unless something is done to check the progress *now*, all the business houses in D.E.I. other than the Japanese will have to reduce their scale and some of them will be forced out of existence altogether. And, once abandoned, it is immensely difficult to regain the commercial sphere of influence.

"We are not against the low priced Japanese commodities which, under the present acute hard times, are benefiting the natives, but it is the Japanese organization of importing and marketing Japanese goods that we are against," says the petition in part. Then it goes on to say that the Japanese should avail themselves of the Dutch organs of shipping, insurance, warehousing and financing in their trade with the Dutch East Indies, and that such a practice will materially contribute to the prosperity of D.E.I. and the Netherlands.

Japanese in D.E.I.

There are no authentic reference data as regards the outstanding commercial activities of Japanese merchants in the Dutch East Indies with the exception of rough estimates. According to such estimates, of the total 1933 imports from Japan into the Dutch East Indies through four main ports of Java, i.e., Batavia, Sourabaya, Samarang, and Cheribon, the Dutch merchants handled 50 per cent of the Japanese goods, the Japanese handled 25 to 26 per cent, and the remainder of imports were done by the Chinese and others.

Where volume is concerned, the amount handled by the Dutch is by far larger than that of any other nation, but it is also known that the profit out of their transactions was very small. It is even said that their business might have ended in losses. For one thing, the Dutch merchants are said to be speculative in their transactions; they import in large quantities without any tangible calculations as regards how they can dispose of their holdings. As the result, they are apt to suffer from the accumulation of stock which naturally forces down market quotations. Then they are not shrewd enough in purchasing Japanese goods in Japan. They open branch offices in Osaka or Kobe, summon Japanese merchants to their offices and close deals in a lordly manner. Moreover, their cost of transportation is also high for the charges by the Dutch and German organs of shipping, insurance, and warehousing are generally higher than that of the Japanese rival companies.

These disadvantages reduce the profits of Dutch merchants in their handling of Japanese goods. It in turn diminishes their interest in Japanese goods. Then the volume of business they do tends to decline, and so they afford chance to the Japanese, who are contented with a smaller margin of profit, to cut into their sphere of influence. And, it has thus resulted in the promulgation of the emergency import restriction act by the Batavia Government in September, 1933.

Under the emergency import restriction, the Batavia Government limited the import into D.E.I. of Japanese cement in September, 1933, beer in December, 1933, cotton sarong in February, 1934, and cambric and bleached cotton textiles in March, 1934. So Japan may export to the Dutch East Indies not more than 200,000 barrels of cement a year; beer and sarong are restricted by their respective quotas worked out on the basis of actual trade in 1930 and 1931 (when the volume was small); cambric and other bleached textiles must not exceed a total of 51,700,000 square yards.

In addition to the quantitative restrictions of these Japanese goods, the Batavia Government proposes to select the merchants who may handle these articles of trade by means of a license system. If this system is put into effect, it would virtually wipe out the

Japanese importers in D.E.I. For according to this system, individual merchants are to be divided into three classes on the basis of their respective qualifications which are: Class A.: merchants who are members of more than 10 Chambers of Commerce in different parts of the D.E.I.; Class B.: merchants who are members of not more than nine Chambers of Commerce; Class C.: merchants who do not belong to any Chamber of Commerce in D.E.I. And, Class A. merchants may handle 60 per cent of the entire imports into D.E.I. of Japanese goods; Class B., 30 per cent, and Class C., remaining 10 per cent of the total.

It is learned that there are only four Dutch companies which satisfy the qualification for Class A. that is, these four companies are to be authorized to handle up to 60 per cent of the entire D.E.I. imports of Japanese goods. Moreover, a Dutch company in Class B. is said to have been granted a license to the extent of 14.5 per cent, or about one half of the total of 30 per cent granted for this class. In other words, five Dutch companies are to monopolize up to 75 per cent of the aggregate total import trade with Japan, and the Japanese, Chinese, and other companies, inclusive of minor Dutch firms, to divide the remaining 25 per cent of the aggregate total among themselves by free competition.

One Sided Trade

Japan's trade with the Dutch East Indies has made remarkable developments during the past three years because of the spasmodic increases shown in exports. As the result, the excess of exports to D.E.I. which amounted to Y.17,370,000 in 1931 rose to Y.59,842,000 in 1932, and it again almost doubled to Y.101,778,000 in 1933 (Meanwhile the Japanese imports from D.E.I. which totalled Y.46,000,000 in 1931 advanced to Y.55,700,000 in 1933).

According to the Japanese Finance Office trade returns, Japan's trade with the Netherlands and the Dutch East Indies during the past three years was as follows: (Unit: Y.1,000)

JAPAN'S EXPORTS

To	*1933*	*1932*	*1931*
Netherlands	12,325	12,444	10,136
D.E.I.	157,487	100,251	63,450
Total	169,812	112,695	73,586

JAPAN'S IMPORTS

From	*1933*	*1932*	*1931*
Netherlands	3,717	3,879	3,882
D.E.I.	55,709	40,409	46,080
Total	59,426	44,288	49,962

TRADE BALANCE (JAPAN'S EXCESS OF EXPORTS)

To	*1933*	*1932*	*1931*
Netherlands	8,608	8,562	6,254
D.E.I.	101,778	59,842	17,370
Total	110,386	68,404	23,624

ARTICLES OF TRADE JAPAN'S EXPORT TO D.E.I.

Items	*1933*	*1932*	*1931*
Cotton textiles	78,273	50,229	28,297
Silk, rayon, textiles	15,989	14,366	8,910
Knitted goods	4,235	2,525	1,570
Iron manufactures	4,366	2,575	842
Porcelain	3,729	2,414	1,712
Total, including others	157,487	100,251	63,450

JAPAN'S IMPORTS FROM D.E.I.

Items	*1933*	*1932*	*1931*
Sugar	12,786	3,133	15,787
Mineral oil	15,830	14,513	12,636
Crude rubber	7,268	4,995	3,206
Total, including others	55,709	40,409	46,080

An outstanding feature of the trade relations between Japan and the Dutch East Indies is that it is heavily one-sided. The Japanese imports from D.E.I. are increasing but the percentage is not impressive. Moreover, because of depreciation of the yen exchange rate, this increasing ratio is further diminished when considered in terms of guilders.

The Dutch East Indies' foreign trade is made up of exports of raw materials, such as sugar, crude rubber, petroleum, tea, zinc, coffee, tobacco, and so on, and of imports of industrial manufactures. The D.E.I. has hitherto purchased these industrial manufactures from the Netherlands, Britain, and other European countries which are good customers of the D.E.I. raw materials. Since the advent of Japanese industrial goods, however, the imports from the Netherlands and other European countries have declined while Japan, although it has taken the place of these European countries in the D.E.I. imports trade, does not want many of the D.E.I. products. This is one of the most important factors which makes the pending issue between the D.E.I. and Japan difficult, especially as the European countries are trying to recover their lost market, with a reminder that they are buying much from the D.E.I.

Japanese Point of View

Japan is sympathetic with the Dutch East Indies' request of having a barter system worked out between the two countries. And, Japan is willing to buy from the D.E.I. as much as possible. Nevertheless, it is regarded as difficult to satisfy the D.E.I. aspirations in full. For one thing, there are only a few things that Japan can buy from that country.

Take sugar, for instance; it is understood that the Batavia Government hopes to make Japan buy more Java sugar in view of the enormous surplus now accumulated in that country. The sugar industry in Japan, however, has made such development that it has reached the stage of self-sufficiency, and the supply is being regulated by means of curtailment. Moreover, sugar production is encouraged in Taiwan (Formosa) to restrict the rice output in that island. Japan at present buys about 100,000 tons of crude sugar from Java only to be re-exported to Manchuria and China after it is refined in this country. Consequently, Japan cannot increase the import of crude sugar from Java unless the demand in the Asiatic continent substantially increases.

And there is petroleum. If Japan buys from the D.E.I. part of its requirements now obtained from the United States, it would contribute to balancing of the present one-sided trade. Nevertheless, the Dutch oil is expensive as compared with the American supply. Unless a happy measure of diminishing the loss resulting from the high price is found, it is difficult for Japan to buy the Dutch oil. Such economic obstacles cannot be overcome by a mere spirit of mutual conciliation. Moreover, if Japan were to buy from the Dutch East Indies to the extent of balancing the trade regardless of these economic obstacles, that would be a concession only on the part of Japan.

It will be recalled, furthermore, that Japan's trade with the Dutch East Indies used to end in a heavy excess of imports into Japan up to about 1928, and that it was after the brisk export in recent years of cotton textiles, rayon goods, and sundry commodities to that country that the trade balance has become favorable to Japan. And these Japanese exports to that country are daily necessaries indispensable for the Japanese. On the other hand, the Dutch East Indies is primarily an agricultural country, producing principally cereals, sugar, cane, and crude rubber, and there are no manufacturing industries that need be protected even by restricting the import of low priced Japanese goods. In view of the Japanese supply of sundry commodities at low prices and the benefit resulting therefrom, the exclusion of Japanese goods from the Dutch East Indies would be contrary to the interest of the masses in that country, and it is likely to bring forth unfavorable effects upon the colonial administration there.

Another thing of importance is the proposed exclusion of Japanese merchants from the Dutch East Indies under the license system. The proposal undermines the foundation of the commercial right that the Japanese established there after many years of hard effort. So Japan must safeguard it at any cost.

Japanese goods exported to the Dutch East Indies used to be handled by the Chinese merchants there exclusively. They were therefore sold at higher prices, and the transactions were often hampered each time anti-Japanese sentiment was aroused in China. So the Japanese went over to the Dutch East Indies to carry on the business there and have succeeded in reducing prices, as the result of their better service. It is incomprehensible from the Japanese point of view that the Batavia Government should endeavor to exclude Japanese merchants from that country. Admitting that the commercial rights of the Hollanders and the Japanese in the Dutch East Indies must be respected, the Japanese cannot pass unchallenged any unwarranted oppression that is proposed to be brought upon the Japanese merchants in that country.

The New Works of the Shanghai Gas Co.

By *WALTER T. DUNN, M.I.Mech.E.*

During his visit to the gas undertakings in the Far East, including those of Japan, Hongkong, Singapore and Colombo, the writer had the opportunity, through the courtesy of the Engineer-in-Chief, and Manager, Mr. W. J. Baker, of seeing the Works owned by the Shanghai Gas Company.

Since then, in the year 1929, an important new installation has been laid down, with a modern plant.

The original Works were contained on a small area of land of about 0.65 acre in extent, at the junction of Soochow Creek and Thibet Road. Their erection was commenced in the year 1864.

The development of the undertaking from the early years of its establishment will be realized from the following figures, which have been supplied by Mr. Baker:—

Year	*Site area Acres*	*Gas made cub. feet*	*No. of Consumers*	*Price of Gas: Dollars*	*Length of Mains: Miles*
1866	0.65	5,318,000	58	4.50	4.80
1931	7.40	805,000,000	13,000	2.95	172.84

During the past six years the consumption of gas has increased by approximately 50 per cent.

In 1931 it was decided to purchase a new site on the Whangpoo River, and erect a comparatively completely up-to-date gas-making plant capable of producing four million cubic feet of gas per diem, with the prospect of possible extensions with a view to a maximum output of 10 millions per day. A Plan of the new Works is given in Fig 1 prefaced by a photograph of the staff of the Company.

The new plant includes:—

(1) Machinery for the mechanical transport of all coal and coke; and coke-screening machinery.

(2) Upwardly-heated continuous vertical retorts by the Woodall-Duckham Vertical Retort and Oven Construction Company, Ltd. (1920), of Westminster.

(3) Dri-gas and Naphthalene-elimination Plants; by Messrs. W. C. Holmes & Co., Ltd., of Huddersfield.

(4) Carburetted Water Gas Plant of 2,000,000 cubic feet per day capacity (in duplicate); by Messrs. Humphreys and Glasgow of London.

(5) Station Meter of the Holmes-Connersville type; by Messrs. W. C. Holmes & Co., Ltd., of Huddersfield.

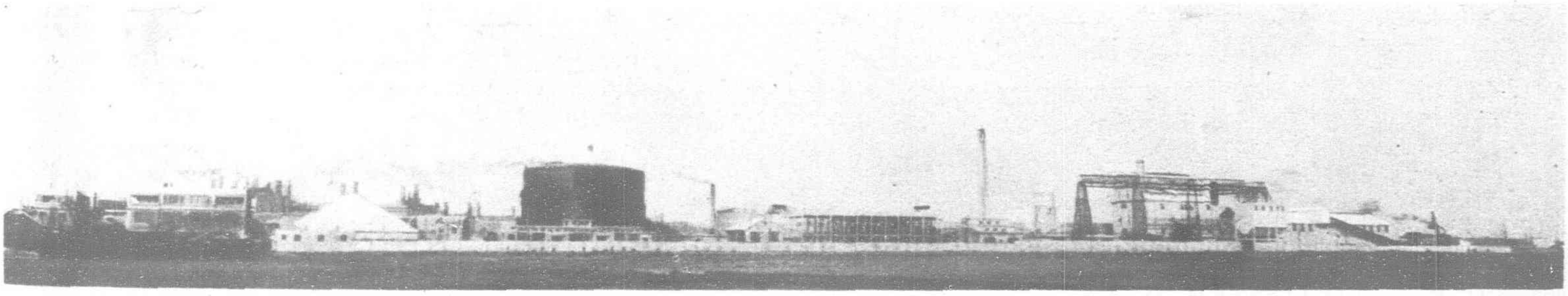
(6) Many other modern improvements.

The new site is about seven miles away from the old one, and gas made at the former is pumped by Ingersoll-Rand compressors to the gasholder station which remains at the old site.

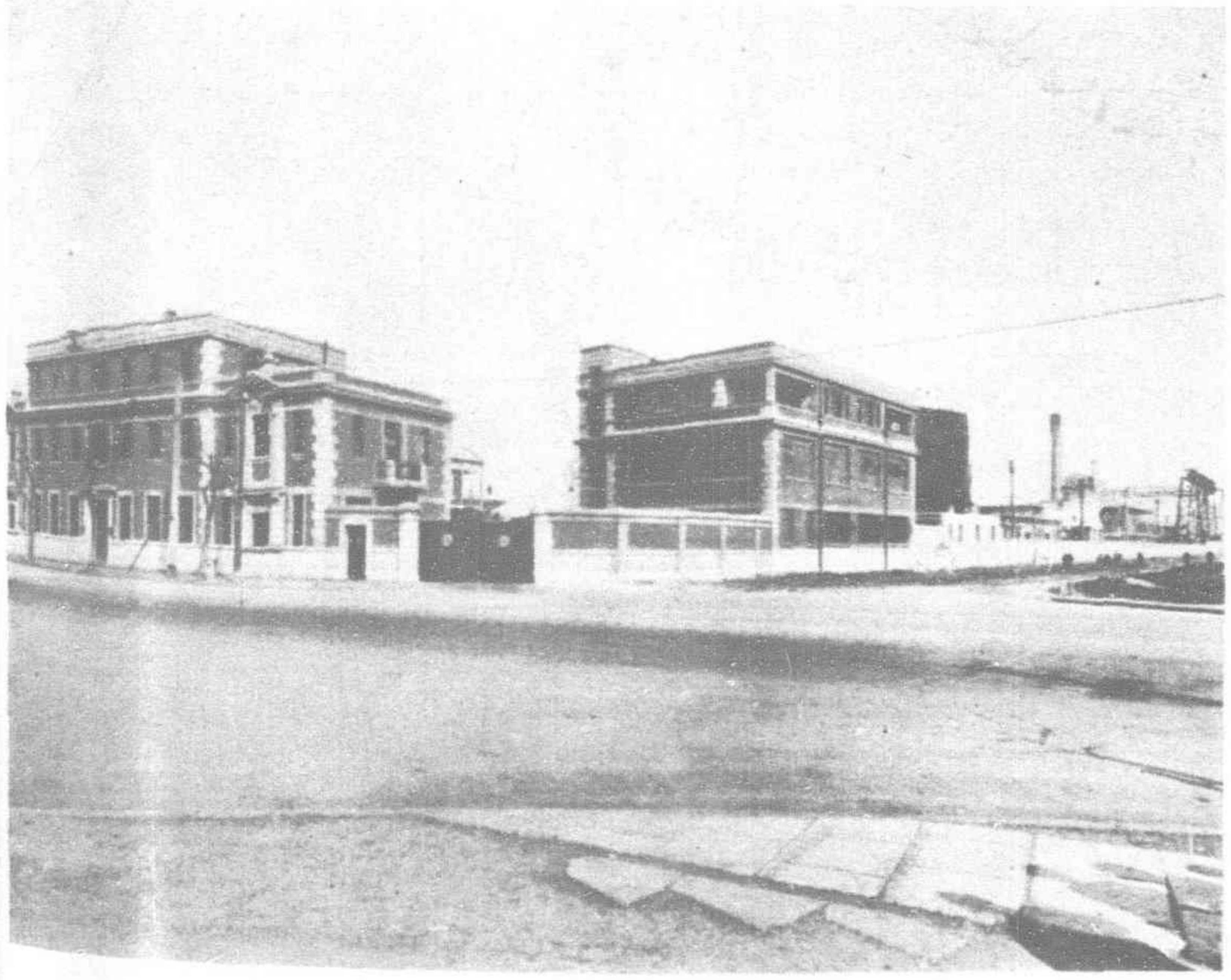
Referring to Fig. 1, at one end of the Works is the Whangpoo River, where the coal is delivered, Yangtszepoo Road being at the other end; and Lungchang Road skirting one side.

General Arrangement of Plant

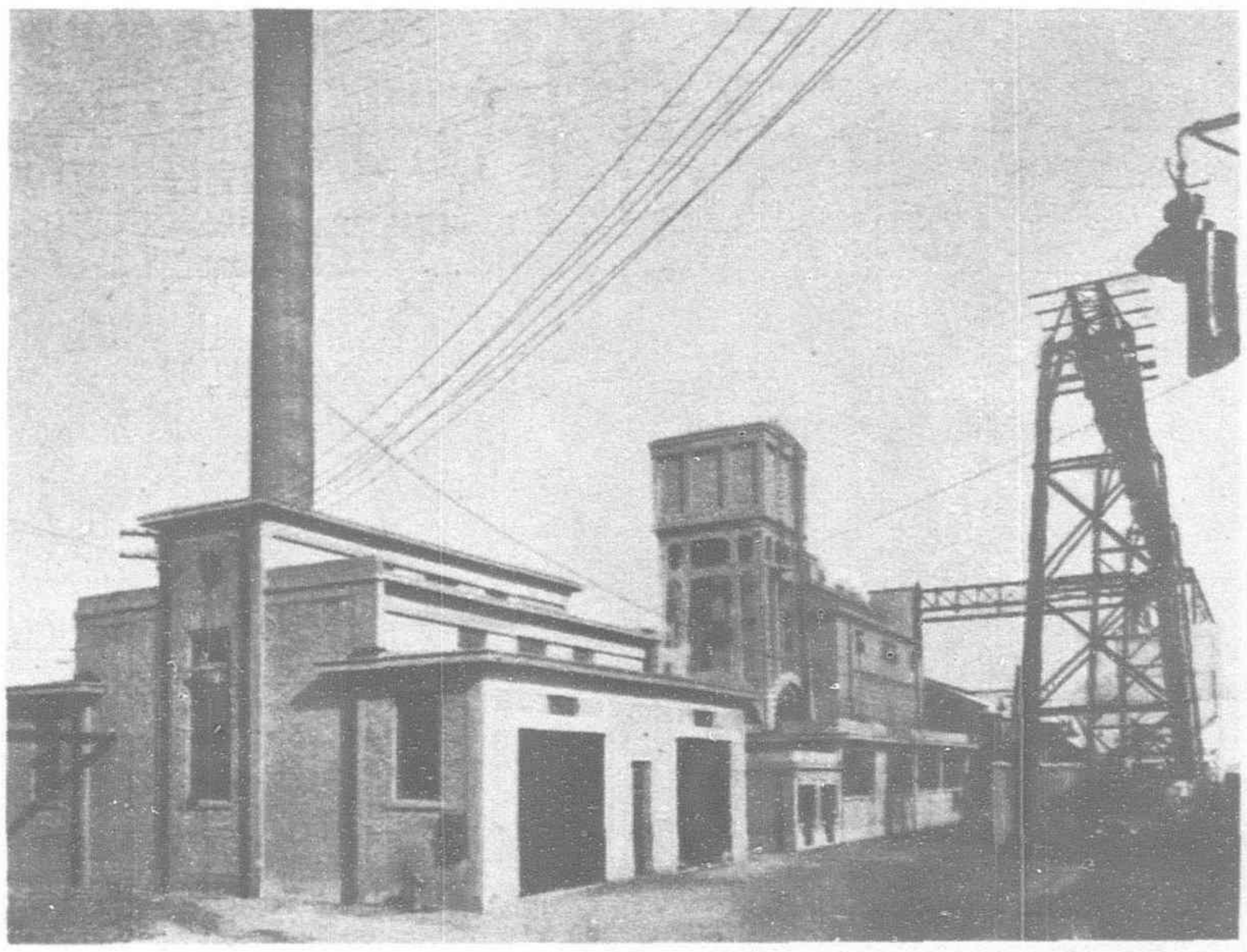
It will be observed that, starting from the Whangpoo River, the two coal stores (each of a capacity of 5,000 tons) are situated at the quayside. The mess-room, dressing-rooms, and baths for the Chinese operatives are near by. Next comes the 4,000,000 cubic feet per day vertical retort house, adjoining which is the water-gas plant and coke bunkers. By a Telpher track, coke is conveyed parallel to Lungchang Road. Adjacent to the water-gas plant are the condensers for that plant, and the water-gas tar-separator with oil-tank below it; then follows the water-gas holder.



Panoramic view of the New Works of the Shanghai Gas Company



View of Offices and Workshops of the Shanghai Gas Company



View of a section of the Works of the Shanghai Gas Company with Boiler House in foreground

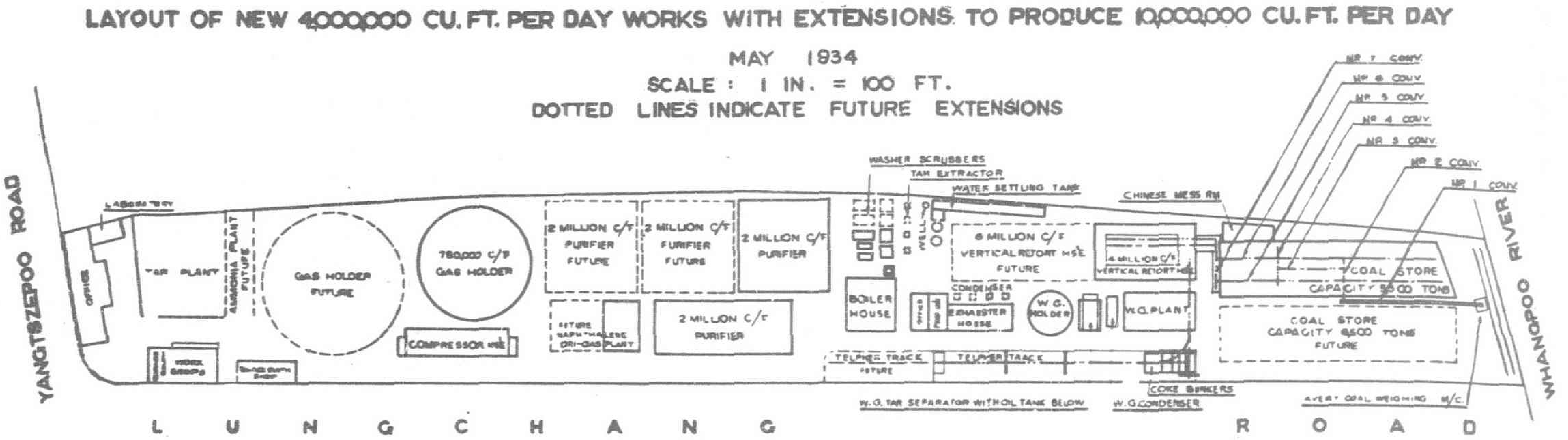


Fig.—1

Next to the vertical retort house has been left an area of ground sufficient for the erection of a supplementary vertical-retort-house for the ultimate erection of a 6,000,000 cubic feet per day plant, including condensers, exhausters and pump. There will be a suitably fitted office close by. The boiler-house, with chimney-shaft occupies a contiguous position, followed by a 2,000,000 cub. ft. purifier. Two other purifiers, each of the same capacity, will be erected when the extensions are carried out. They are shown dotted in the plan.

Near the site for the purifiers are the 4,000,000 cubic feet per day naphthalene and dri-gas plant; the benzol plant; and the station meter. Provision has been left close by for laying down two further similar naphthalene and dri-gas plants, each of 2,000,000 cubic feet per day capacity.

Next to the benzol plant has been erected a 750,000 cubic feet gas-holder; and the compressor house; while an area has been set apart for a future gas-holder of larger capacity. Then comes the ammonia plant; the tar plant; and the large office in Yangtszepoo Road. The blacksmiths' shop; workshops; (with garage below) complete the general lay-out.

It may be stated here that all the machinery of the new works is electrically driven.

The district gas supply is boosted by Holmes-Connersville high-speed compressors, which are installed in duplicate, each having a capacity of 300,000 cubic feet per hour. They are actuated by the Ward-Leonard system of electric drive.

The Shanghai Gas Company operates its own workshops, and also carries out repairs to all district apparatus. The staff consists of 43 British and other foreigners, and about 750 Chinese operatives are employed.

An almost entirely domestic load is provided for, as will be observed from the following analysis:—

	per cent
Public Lighting	3.56
Heating (Domestic)	77.53
Industrial	17.00
Gas Used on Works	1.91
	100.00

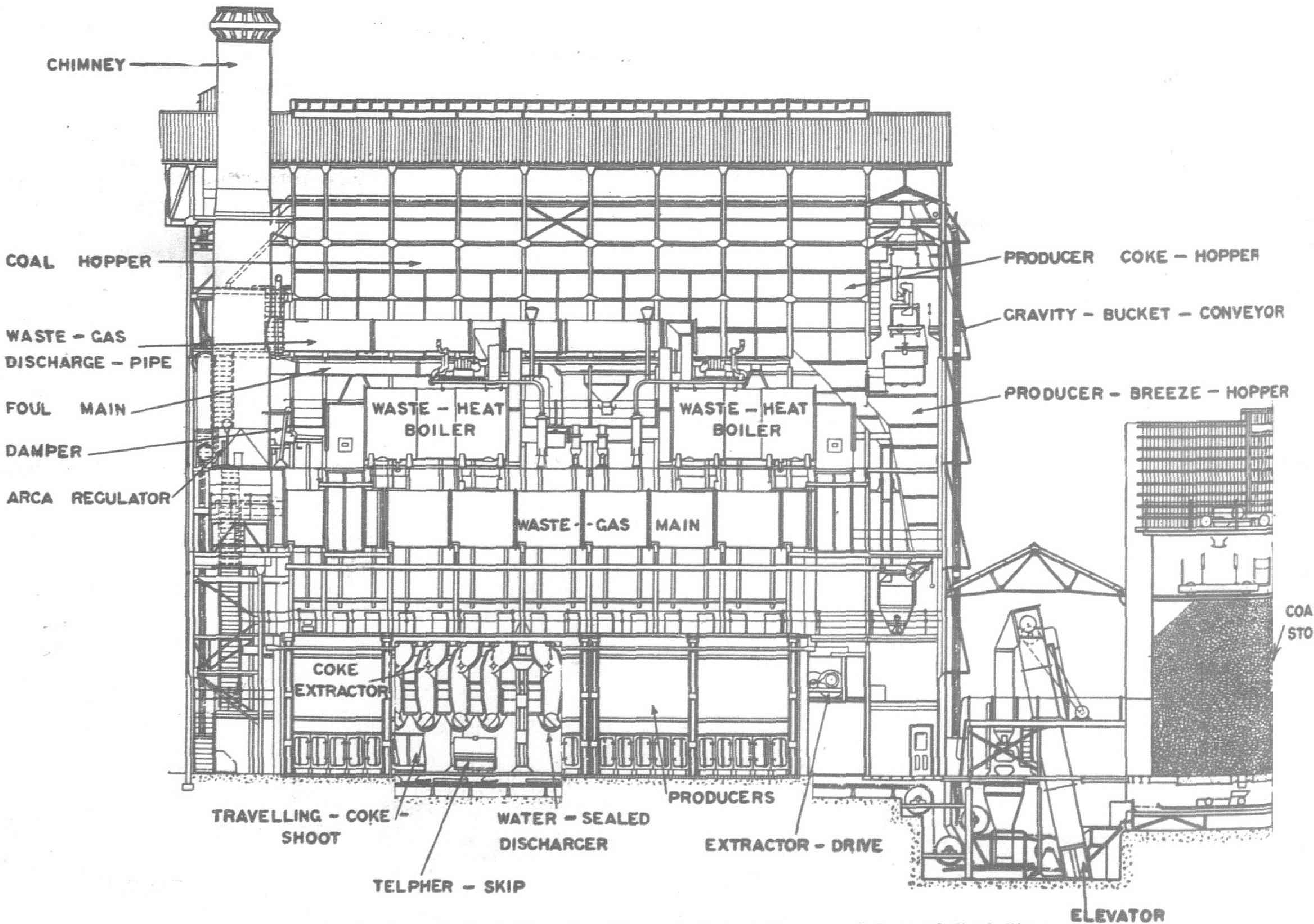


Fig. 2.—Longitudinal Elevation Through Retort House and Part of Coal Store

The bulk of the coal carbonized is of Japanese origin; and some comes from Manchuria. Small quantities of Chinese coal are also carbonized. A good market is obtained for coke, coal-tar, and its derivatives.

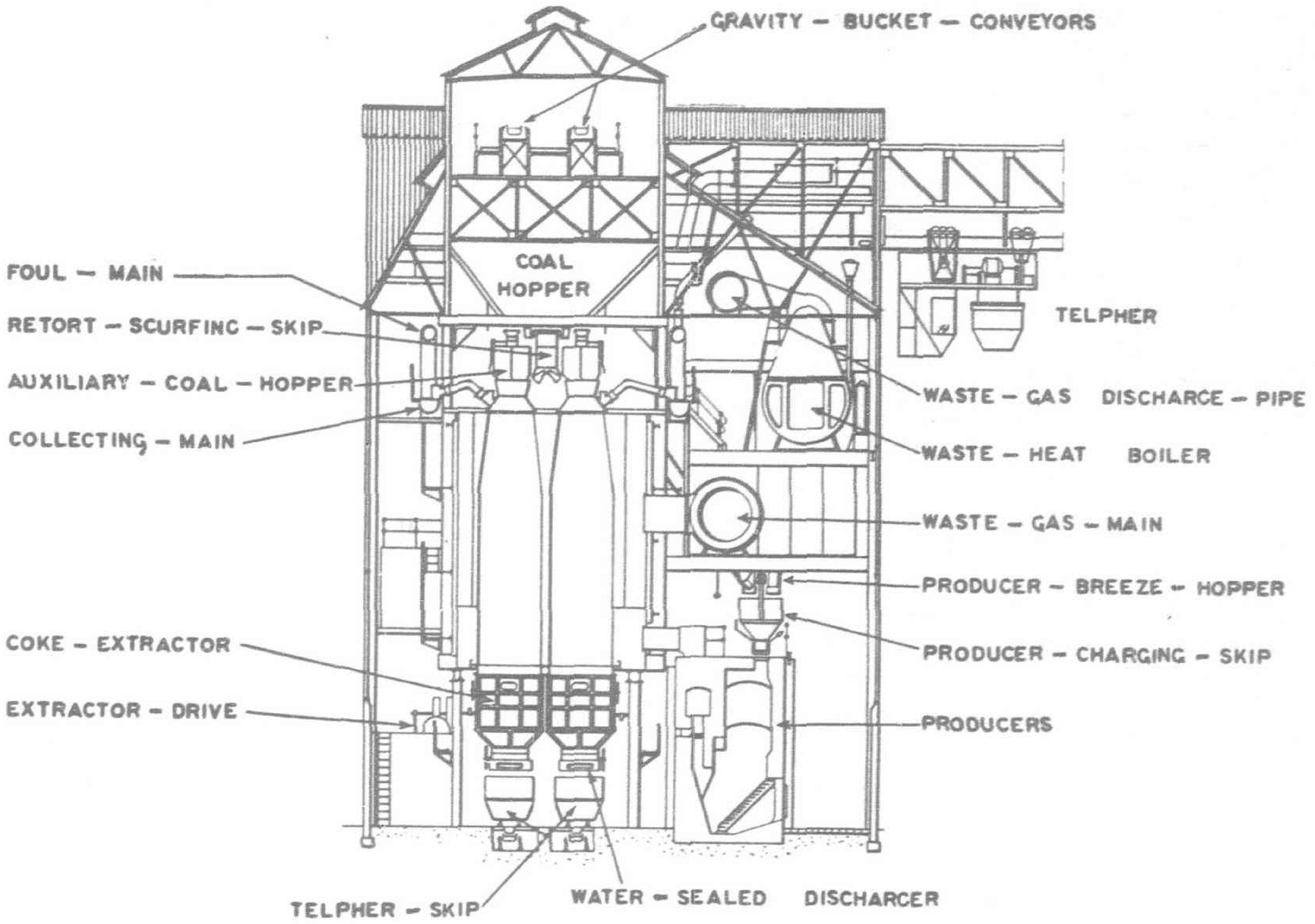


Fig. 3.—Cross Section Through Retort House

Carbonizing Plant

This plant, supplied by Messrs. The Woodall-Duckham Vertical Retort and Oven Construction Company, Ltd., consists of one bench of thirty 80 inch major-axis upwardly-heated continuous vertical retorts, capable of producing four million cubic feet of gas per day from coal.

The coal is brought to the Works by water and is unloaded, by a crane on the quayside, on to a system of band conveyors feeding either into a covered coal store or direct to the retort house. Other band conveyors are arranged for taking coal out of storage and delivering it into the retort house.

An automatic weighing-machine is interposed between the coal-store and the retort-house, so that all coal entering the latter can be weighed.

Coke from the retort-house is dealt with by a three ton Telpher machine, on the track of which there is a weighing machine; it then proceeds to the coke-screening and storage-plant arranged for delivering into vehicles, or into baskets. The delivery-shoots from the storage-hoppers are fitted with de-breezing screens to ensure delivery of clean coke.

Inside the retort-house are two waste-heat boilers, each large enough to receive the waste-gases from the bench of 30 retorts. The amount of steam which can be raised at 120 lbs. per sq. in. pressure with all retorts in operation, is about 14,500 lb. per hour.

A special feature of the plant is the large capacity of the producers, which have been designed to utilize breeze, thereby releasing the maximum quantity of coke available for sale.

The ground on which the Works are built is very poor, consisting largely of silt, brought down by the Yangtze river; all foundations therefore have had to be carried on piles.

Referring to the illustrations, Fig. 2 depicts a longitudinal elevation through the retort-house, and part of the coal-store; Fig. 3 a cross-section through the retort-house. A section through the coal-store, with crane at the quayside is shown in Fig. 4, whilst Fig. 5 is a transverse-section through the coal-store. The general arrangement of the coke-screening plant, and coke storage is illustrated in Fig. 6.

Purifier Installation

This consists of four cast iron luteless purifiers, which were made by Messrs. Newton Chambers & Co., Ltd. Each purifier is 40 feet square and seven feet deep, arranged in one-block and supported on a reinforced concrete staging with a reinforced concrete revivifying floor above the boxes, and reinforced concrete tar and liquor storage tanks below ground-level.

The purifiers are formed of cast iron plates three-quarters of an inch thick to bottom, sides, and divisions, with a cast iron balcony round each of the cover openings. Each purifier has four cover openings 17 feet square, provided with mild steel covers. A machined lip is provided round each cover-opening, and the joint between the cover and the machined lip is made with a rubber strip. The covers are held down by means of swing-bolts fitted with ring-nuts. One cover in each box is provided with an air-plug and test-cock.

The covers are raised by means of hand-operated lifting-blocks, of which there are four, running on the lower flange of a joist, and secured to the underside of the revivifying floor, one runway-joist being fixed over each row of covers. The interior of the purifiers is arranged so that they may be fitted with five-tiers of wood-grids, supported on ledges cast on the side and division-plates, and on cast iron standards. At the bottom of each purifier are four oxide-chutes, from which spent-oxide can be discharged on to the ground level.

At one end of the revivifying-floor a short runway is provided, fitted with a one ton electrically operated lifting-block, by means of which the oxide can be hoisted from the ground-level to the revivifying-floor in suitable skips.

The pipe connections are of mild steel, supported by slings from the underside of the purifier-supporting-girders. Each purifier has one 24 inch inlet, and two 18 inch outlets, each provided with a valve which can be operated by means of a chain from the ground level.

The usual drain-piping, thermometers, and pressure-gauges are provided, together with rainwater pipes, from the revivifying-floor to the ground level. A stairway leads from the ground level to the revivifying-floor, with a landing at the level of the top of the purifiers.

Fig. 7 shows a sectional elevation of the purifiers with various parts indicated.

Carburetted Water Gas Plant

This plant, illustrated in Figs. 8 and 9, was manufactured by Messrs. Humphreys and Glasgow, Limited, of London, and

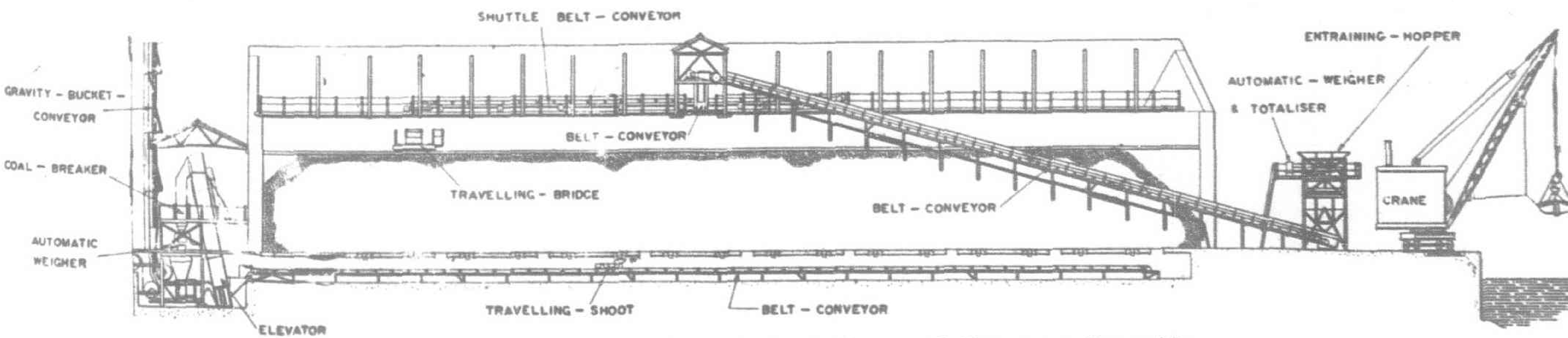


Fig. 4.—Section Through Coal Store and Crane on Quayside

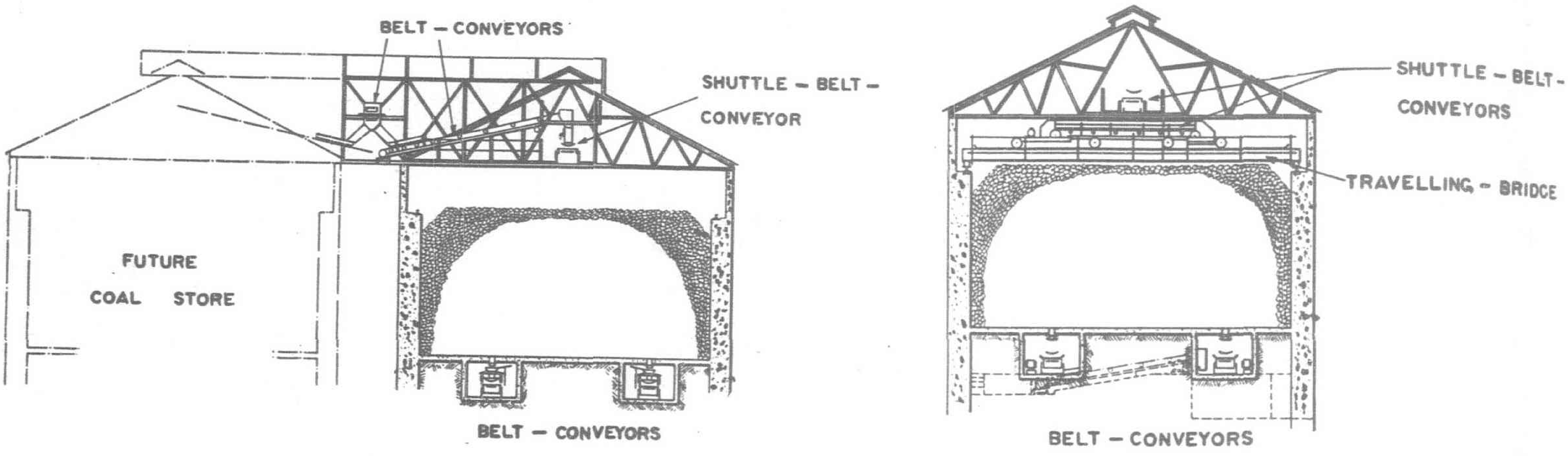


Fig. 5.—Transverse Sections Through Coal Store

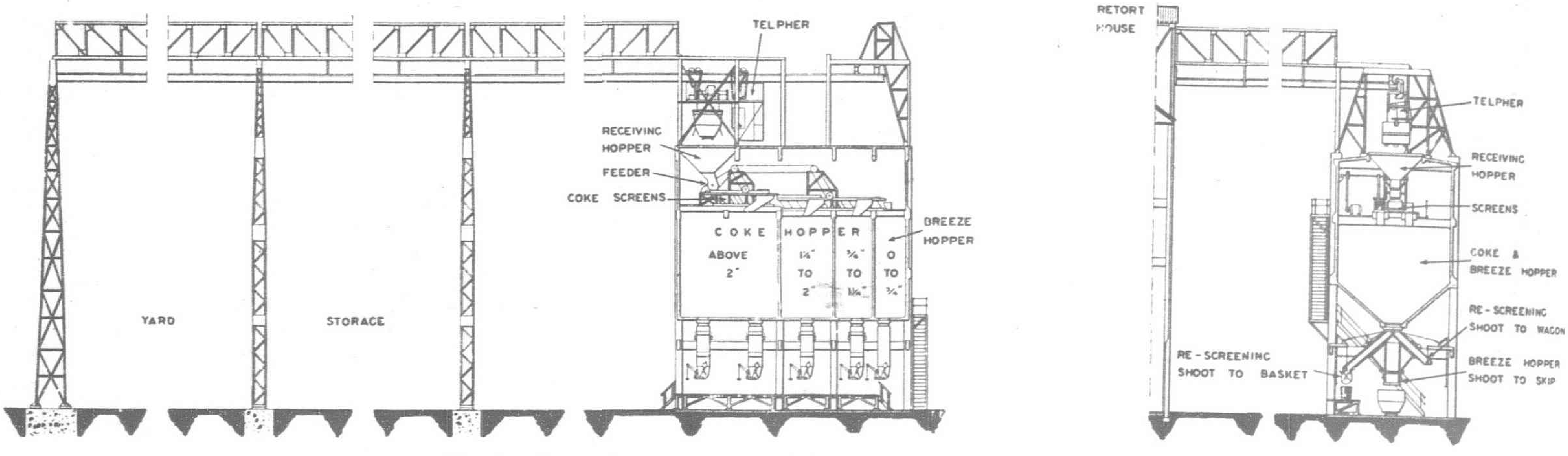


Fig. 6.—General Arrangement of Coke Screening Plant and Coke Storage

comprises two sections, each having a productive capacity of approximately two million cubic feet.

It may here be remarked that a water-gas-plant produces gas by the action of steam on a fuel-bed of incandescent coke contained in a firebrick-lined cylindrical steel generator. The process of gas manufacture is intermittent, periods of gas making, when steam is passed through the fuel bed, alternating with periods of air-blasting, when the fuel is raised to the requisite temperature for gas making; air-blasting alternating with gas making every few minutes. Water-gas made in this way has a calorific value of 290 B. Th. U. per cubic foot or more by the addition of oil-gas produced by spraying gas-oil on to the heated checker-brick, which is contained in the fire brick-lined vessels, through which both the water-gas and the generator-blast-products are passed.

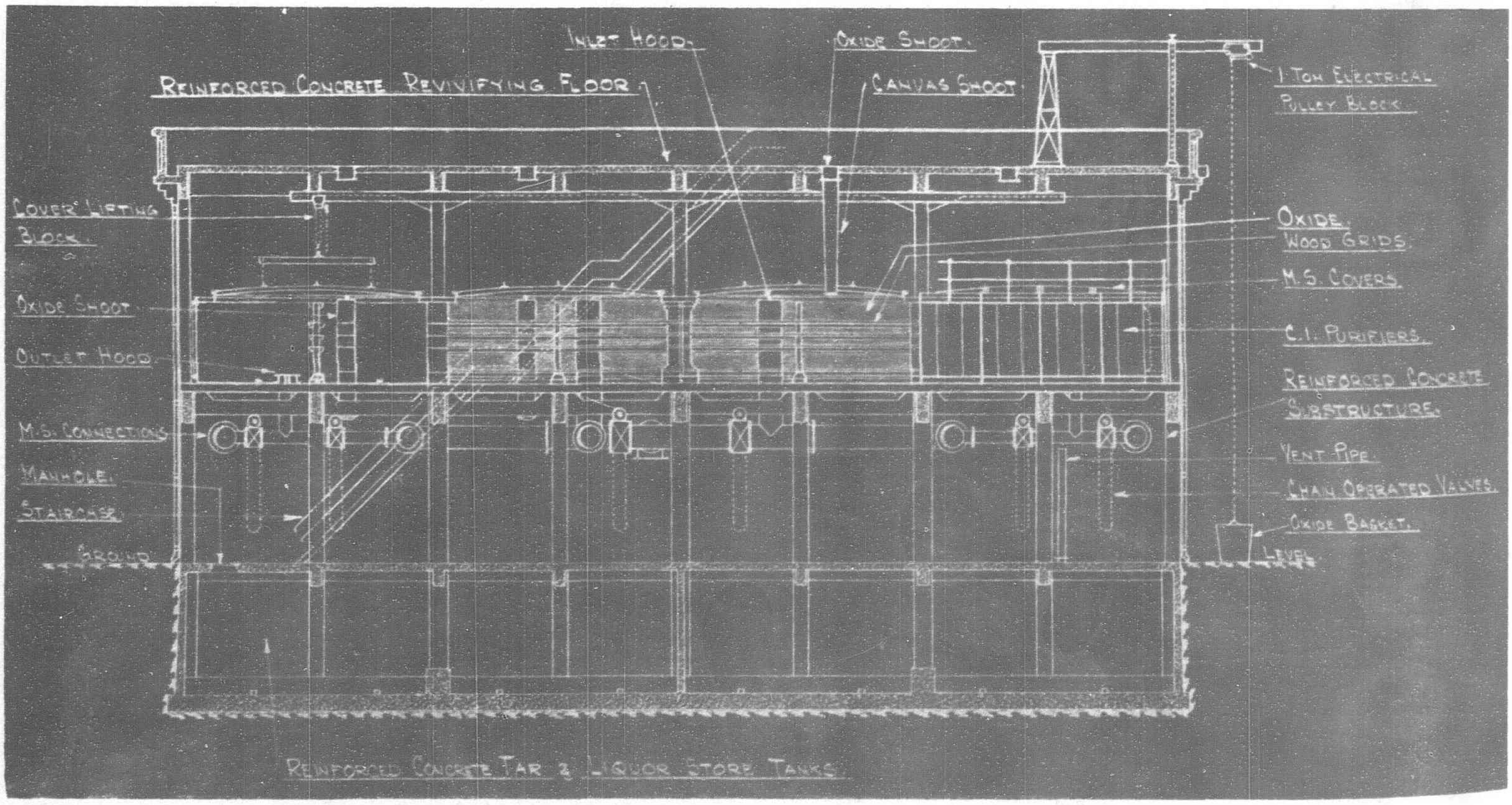


Fig. 7.—Showing a Sectional Elevation of the Purifiers with various parts indicated

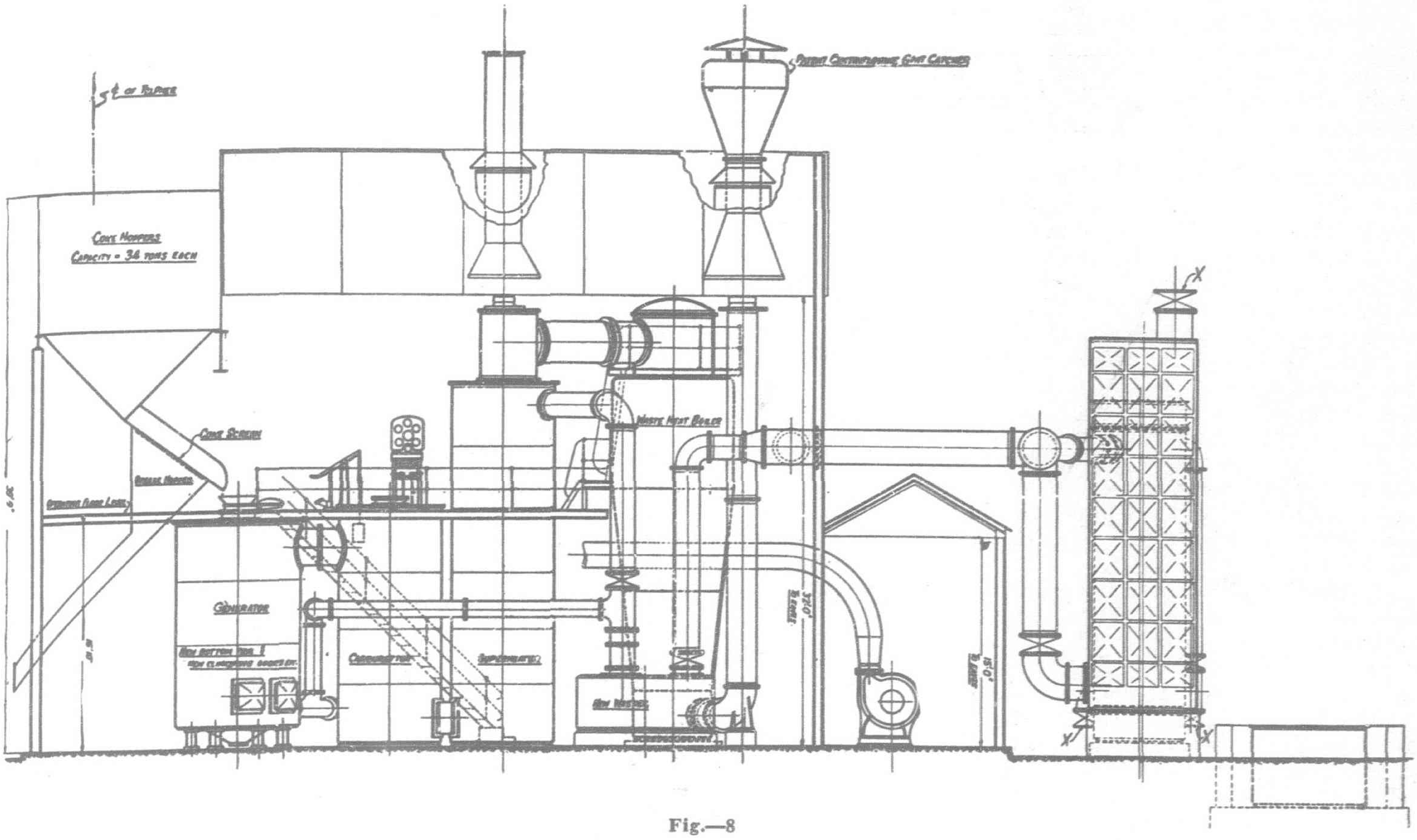


Fig.—8

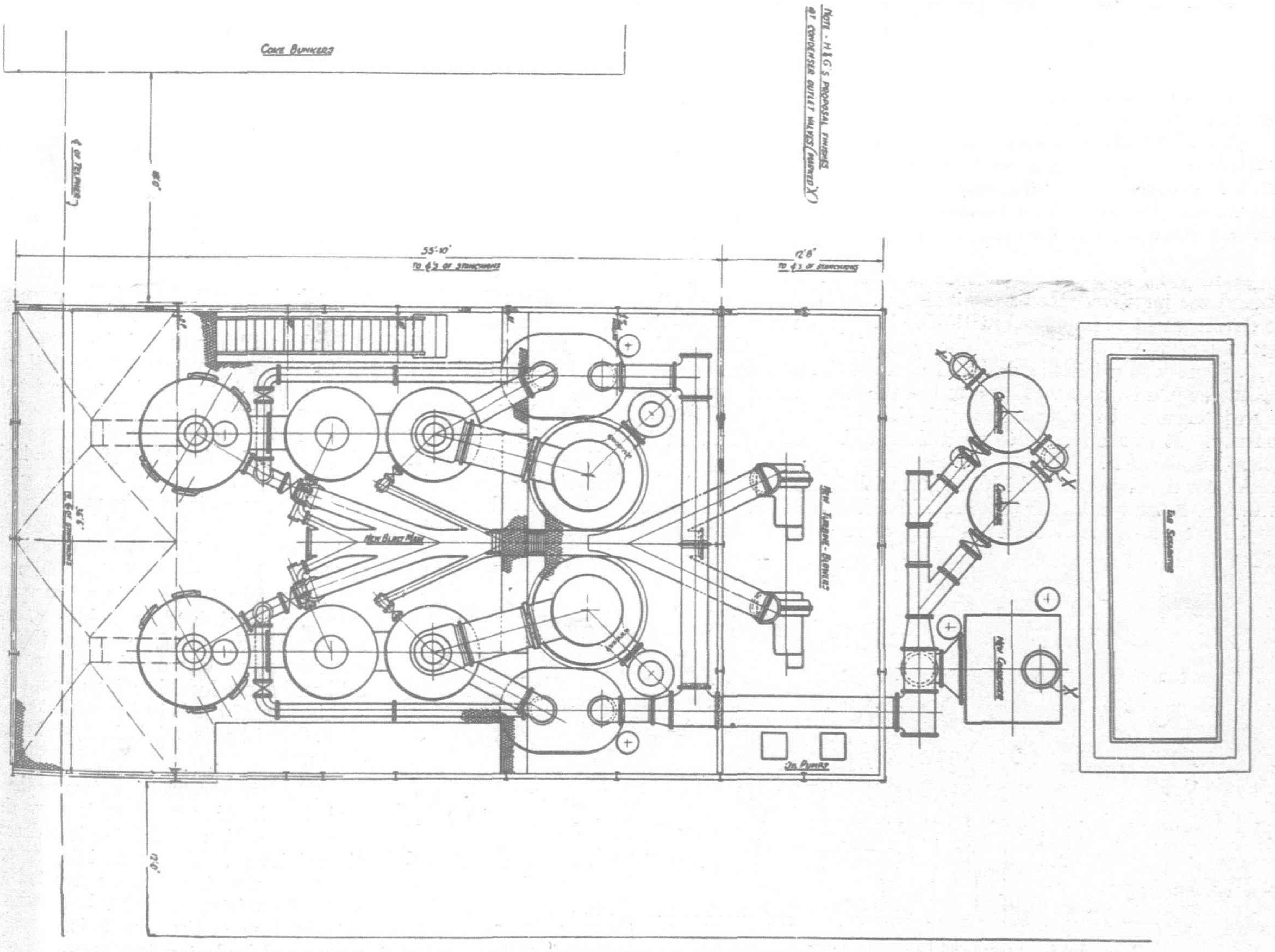

Coke Bunkers
℄ of Telpher
55'-10" To ℄s of Stanchions
12'6" To ℄s of Stanchions
Note.- H & G's proposal finishes at condenser outlet valves (marked X)
New Blast Main
New Turbine-Blowers
Condenser
Condenser
New Condenser
Oil Pumps
X
Vertical Retort House

Fig.—9 The Drawings above show the Carburetted Water Gas Plant for the Shanghai Gas Company by Messrs. Humphreys and Glasgow, Limited, London

Carburetted water-gas is used as an auxiliary to coal-gas manufacture, and plant of this nature possesses the great advantage that it can be brought into full productive capacity from cold within an hour or so. It is, therefore, invaluable as a standby for emergencies, and for taking up irregularities and peak-loads in gas requirements. Moreover it produces cheap gas.

The plant is of Messrs. Humphrey's and Glasgow's latest type, the various working valves being operated by hand. It incorporates the makers' new back-run process, which greatly increases the general efficiency of the plant, and is in every way a marked advance upon the existing plant in the old works, certain parts of which are being used in the construction of the new plant. A maximum of ease, and convenience in operation, is secured in the modernized installation, the operating-handles and levers being conveniently grouped, and the heavier valves being provided with a special counter-balanced device.

Air-blast is obtained by duplicate steam turbine-driven fan type blowers, and special grit-arresters are provided on the smoke-stacks to remove dust and grit from the blast-products, which are discharged into the atmosphere.

After leaving the generating plant the gas passes through a hydraulic washer to new high-duty horizontal-tube-type condensing-plant, and thence to the water gar relief holder.

The plant is installed in a steel frame brick panelled building incorporating overhead coke-storage hoppers, arranged directly below the Telpher which transports coke from the retort-house to the coke-storage yard. Coke is fed by means of gravity from these overhead storage-hoppers to the generators.

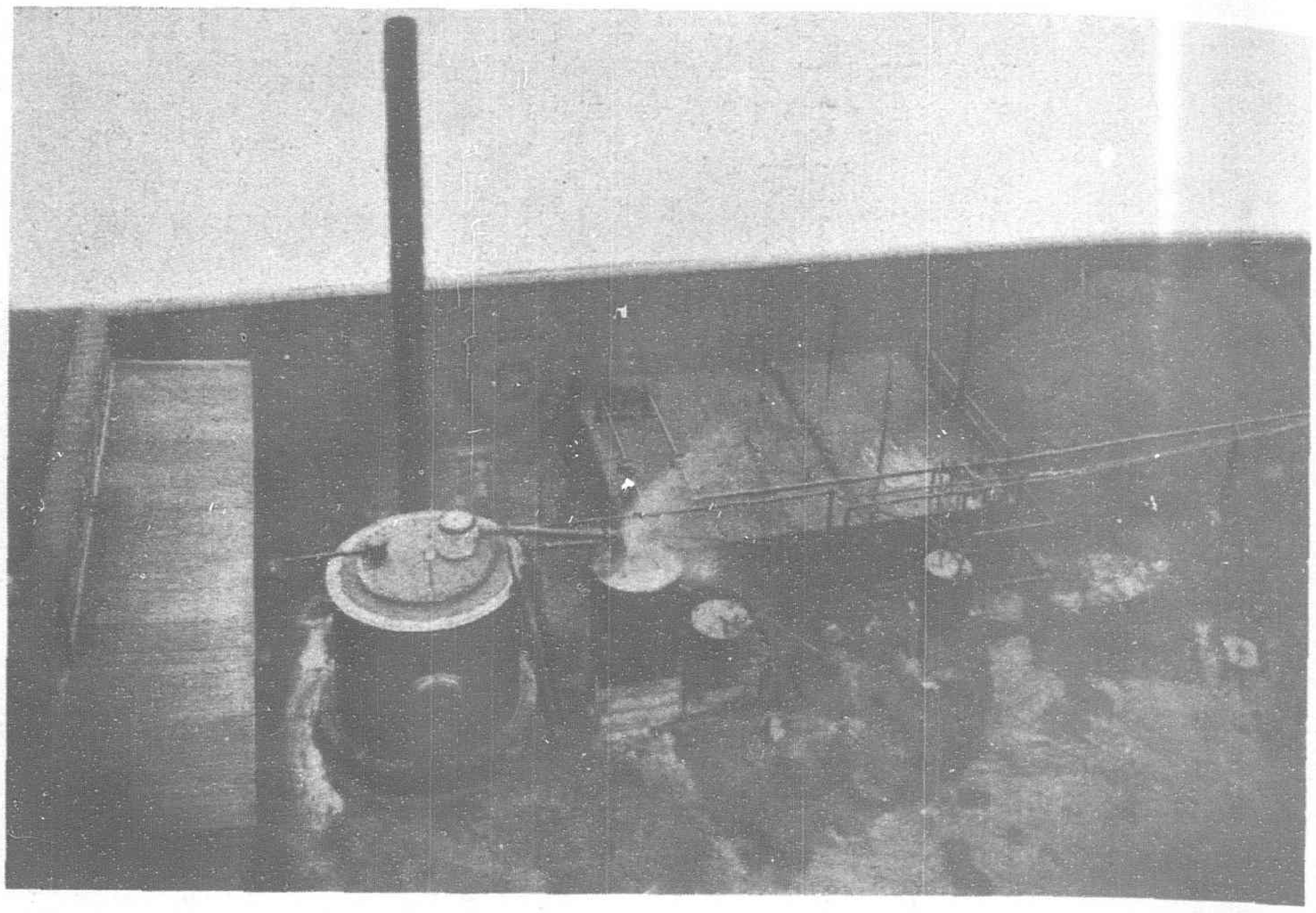


Fig. 10. -Showing Tar De-Hydration Plant supplied by The Thermal Industrial and Chemical (T.I.C.) Research Company Affiliated with the Woodall-Duckham Vertical Retort and Oven Construction Company, Ltd.

Continuous Tar De-hydration Plant

The Thermal Industrial and Chemical (T.I.C.) Research Company, one of the associated companies of the Woodall-Duckham Vertical Retort and Oven Construction Company, Ltd., have supplied the continuous tar de-hydration plant at Shanghai. A photograph of it is given in Fig. 10. It is of 13-15 tons capacity per 24-hours, for the production of road tar.

It may be stated here that during the past few years the demand for improved road tar binding material has necessitated the development of improved methods of tar treatment, which the directors of the Shanghai Gas Company have recognized. The T.I.C. plant was originally designed to meet the need for a simple continuous plant which would permit of the treatment of tar over a very wide range of temperatures with the maximum of safety and economy. It was extended to meet the requirements for mixtures of tar and bitumen.

A later development, which has met with instant success, is the T.I.C. No. 3 tar treatment process, which has been designed more especially to produce a better quality of road tar from vertical retort tar, and several installations of this type are now in operation or are under construction at the present time. The continuous process for the complete distillation of tar to pitch has been extensively improved and simplified.

It may be added that the Woodall-Duckham Company keeps itself fully conversant with the changing demands of tar users, and that its Research Department is constantly engaged upon the investigation of new processes to fulfil their requirements

The tar to be treated is brought into intimate contact with an alloy of low melting point, contained in a suitable still. The alloy can be maintained at any temperature normally employed in the distillation of tar. Intimate contact between the tar and the hot alloy causes the immediate evaporation of some of the oils contained in the tar. The quantity of oil removed in this manner depends on the temperature at which the alloy is maintained. The still is so designed that the vapors leave it quickly, and, by this means, undesirable cracking is avoided. The hot alloy acts as a very efficient medium for delivering the heat units from the heat-generator to the tar under treatment.

The amount of alloy in the still is so much in excess of the amount of material being treated at any one moment that the alloy is able quickly to absorb heat from, or give up heat to, the material when sudden changes in working conditions, or in the compositions of the tar being treated, occur. In this way the hot alloy acts in a manner similar to the function of a fly-wheel in relation to an engine.

As to the advantages of the process it may be mentioned that instead of filling the still with tar, it is filled with a low-melting point metal, which ensures rapid and uniform heat transmission from the furnace. The tar floats in a film approximately an eighth of an inch deep, on the surface of the metal. Carbon, therefore, cannot accumulate on the bottom of the still and cause local heating; and, as only a thin film of tar is in the still at any one time, fire risks are minimized, and priming does not occur.

The time contact between the tar and the heating medium is very short, and degradation of the tar is reduced to the minimum. Tars containing up to 50 per cent of water can be treated with complete safety. By simply altering the rate of feed of the tar it is possible to produce dehydrated tar, road tar, or tar suitable for making bitumen mixtures, and pitch. Distillation takes place at

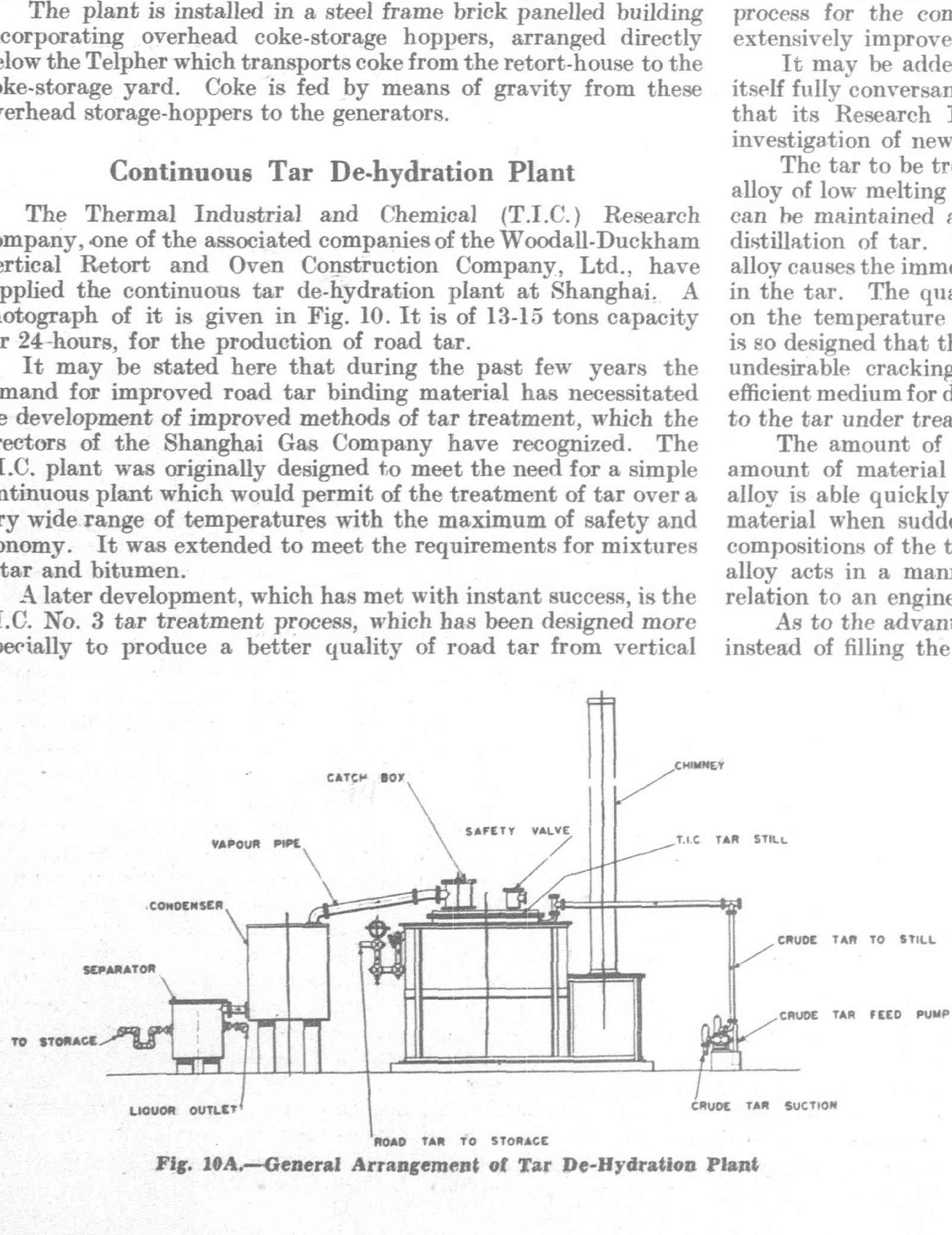


Fig. 10A.—General Arrangement of Tar De-Hydration Plant

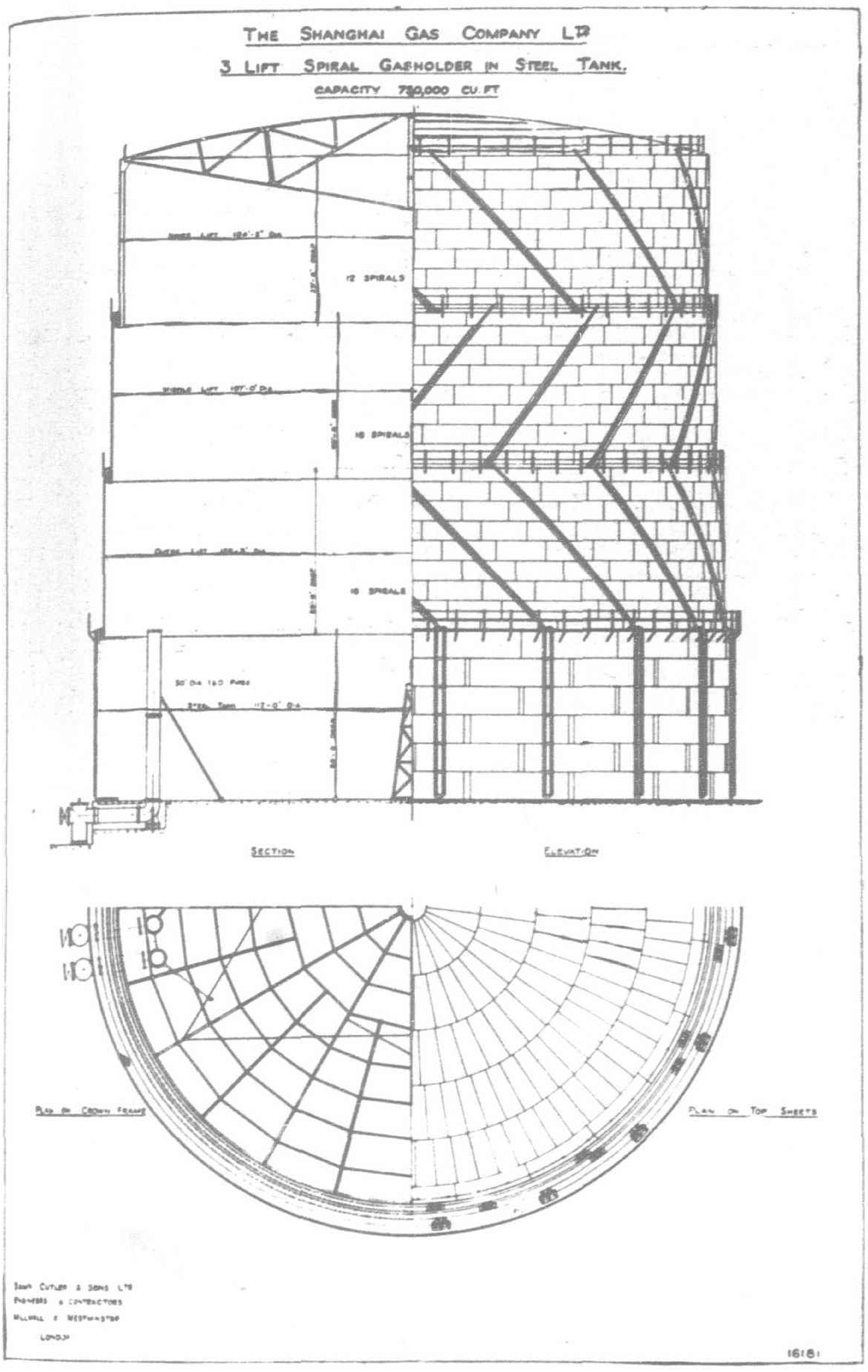


Fig. 13

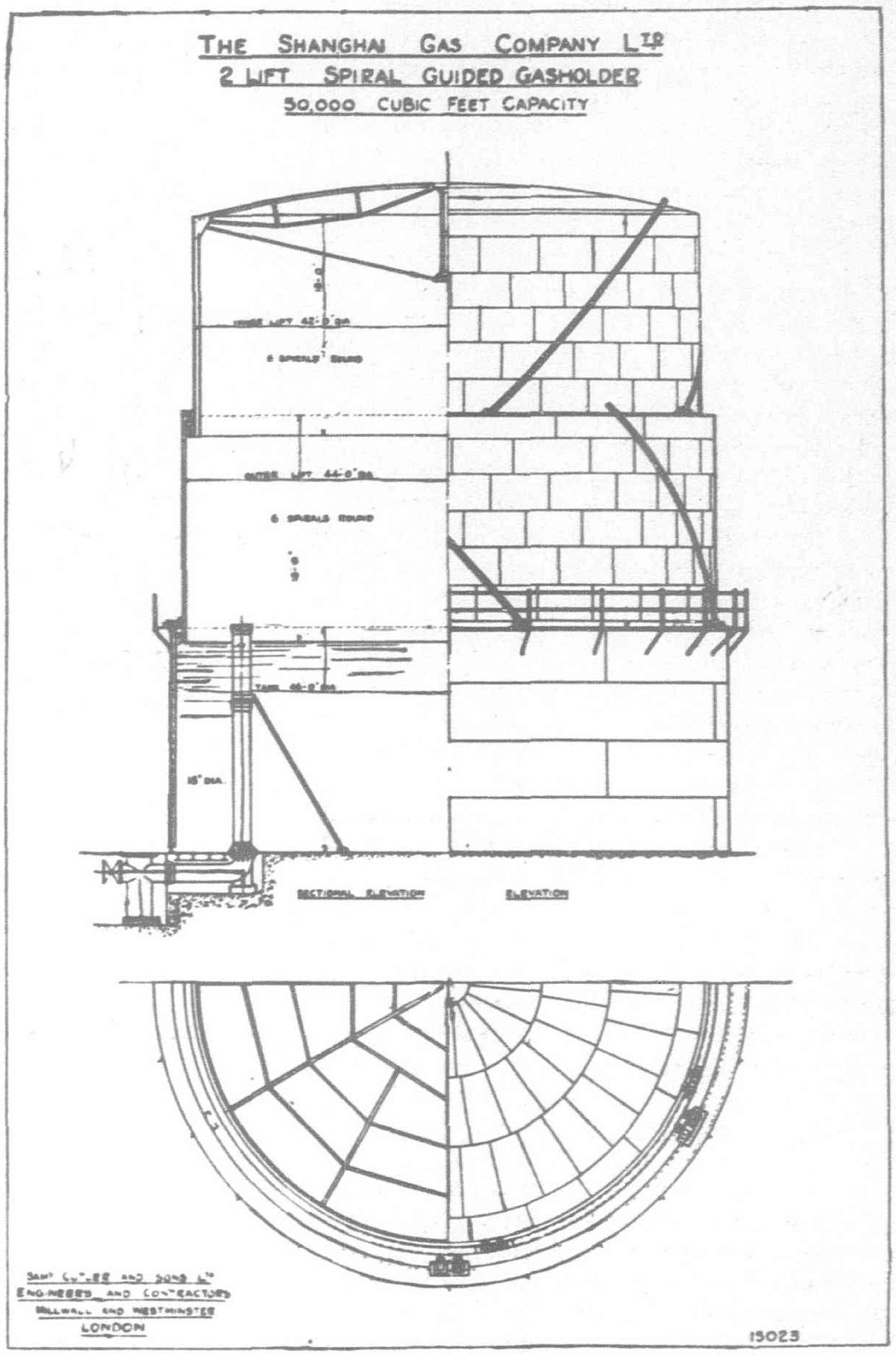


Fig. 14

ordinary pressures and temperatures, and the personal attention usually necessary on those systems which work under pressure is avoided.

Owing to the large volume of metal in the still in relation to the volume of the tar present, it has been found in practice, that the plant is extremely flexible in operation, and can be controlled within a few degrees of the temperature required throughout the entire period of running. Another advantage is that there are no complicated parts or pressure release valves to get out of order, and maintenance charges are extremely low.

The metal employed in the still retains its value even after the other parts have ultimately become worn out, and this point of course has to be borne in mind when considering the capital cost of the plant. Any solid deposit which may accumulate on the surface of the alloy can be removed through the manhole covers, and the dangerous pot still practice of sending men into the still is avoided. The pitch or final tar leaves the plant continuously, and the intense gassing and priming common to the discharge of pitch from pot-stills is eliminated.

It is of interest to note that many crude tars, when subjected to a single straight run distillation, will yield excellent road tars, some of which comply, in all respects, with the British Standard Tar Specification. Crude tar is pumped from the measuring tanks direct to the still "A," where it is brought into intimate contact with the alloy in a molten state. The alloy is maintained at whatever temperature may be necessary to remove a pre-determined percentage of oils, and produce a tar residue of the required consistency.

The oil and water vapors leave the still by a swan-neck and enter the condenser "B." From the condenser the oil and water pass to the separator "C," where the water automatically separates from the oil and each gravitates to its storage tank. The tar residue leaves the still continuously through a seal-pipe, and passes through the cooler "D," when it may be barrelled or delivered to storage.

Being very flexible, it is possible to vary the operation of the plant so as to yield oils from the tar of any required degree. This is done by increasing or diminishing the working temperature of the still, and usually is accomplished by varying the tar throughout.

Modern Gasholders

Gasholders. A new gasholder of 750,000 cubic feet capacity has been erected by Messrs. Samuel Cutler and Sons, Ltd., of Millwall and Westminster, London, and is illustrated in Fig. 13. It consists of three spirally-guided lifts contained in a steel water-tank 112 feet in diameter by 30 feet deep, and when fully inflated rises to a height of about 120 feet above ground level.

The design embodies every modern improvement for safety, correct working, and durability. The entire construction, comprising about 800 tons of British steel was manufactured at the London works of Messrs. Cutler, and the erection on the site has been carried out in a commendably prompt and efficient manner under the direction of their erection experts. The Chief Engineer to the Shanghai Gas Company has expressed himself in these terms.

Messrs. Cutler have also supplied and erected a smaller gasholder for service in connection with the Gas Company's carburetted gas installation. It is illustrated in Fig. 14, and has a capacity of 50,000 cubic feet.

Dri-gas Plant. The directors of the Shanghai Gas Company, realizing the importance of rendering the ideal of service to their consumers, have included in their new installation a Dri-gas plant, which has been supplied by Messrs. W. C. Holmes & Co., Ltd., of

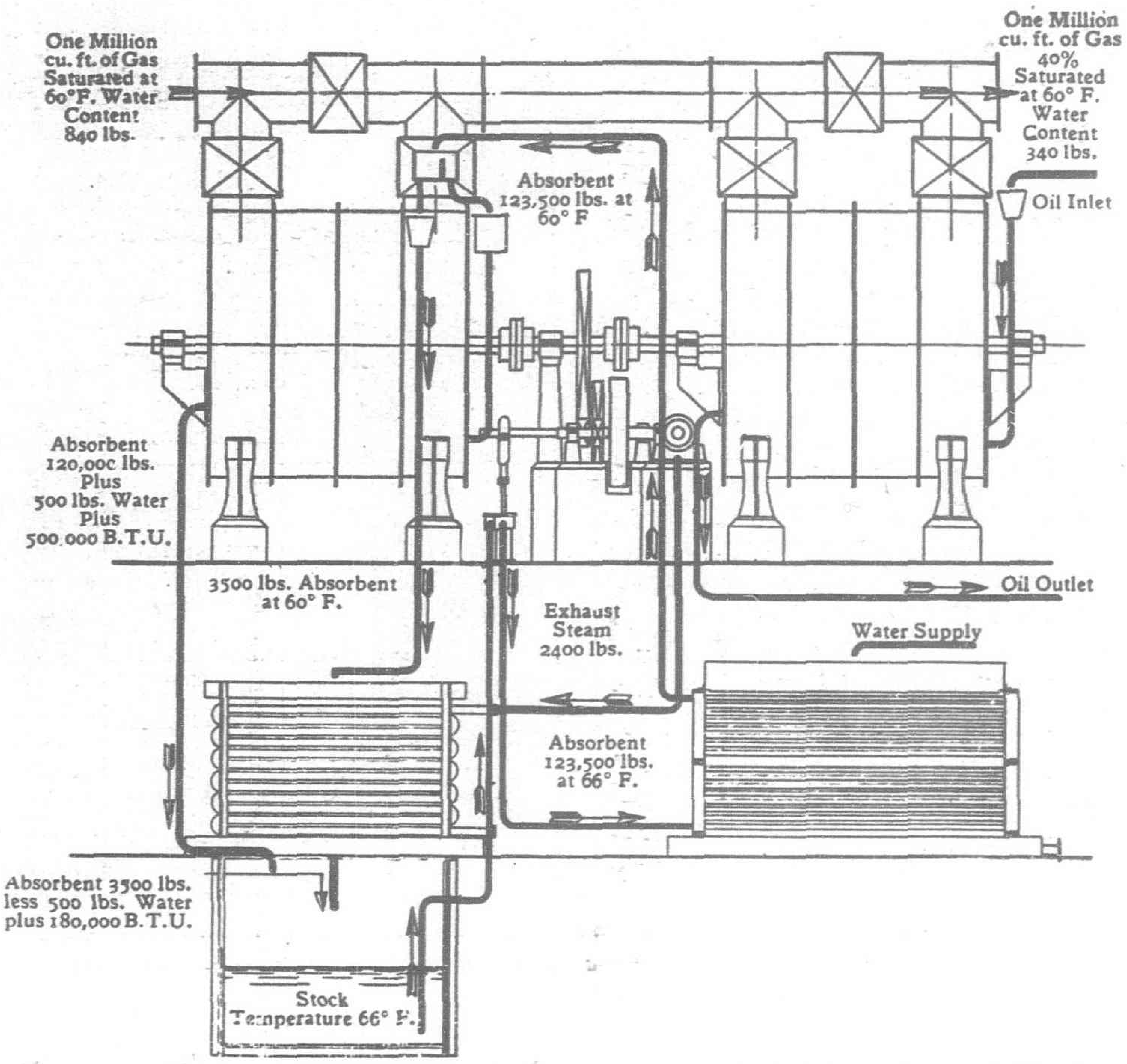

One Million cu. ft. of Gas Saturated at 60°F. Water Content 840 lbs.
One Million cu. ft. of Gas 40% Saturated at 60° F. Water Content 340 lbs.
Absorbent 123,500 lbs. at 60° F
Oil Inlet
Absorbent 120,000 lbs. Plus 500 lbs. Water Plus 500.000 B.T.U.
3500 lbs. Absorbent at 60° F.
Exhaust Steam 2400 lbs.
Oil Outlet
Water Supply
Absorbent 123,500 lbs. at 66° F.
Absorbent 3500 lbs. less 500 lbs. Water plus 180,000 B.T.U.
Stock Temperature 66° F.

Fig. 16.—Diagram of Holmes Combined Dri-Gas and Naphthalene Removal Plant

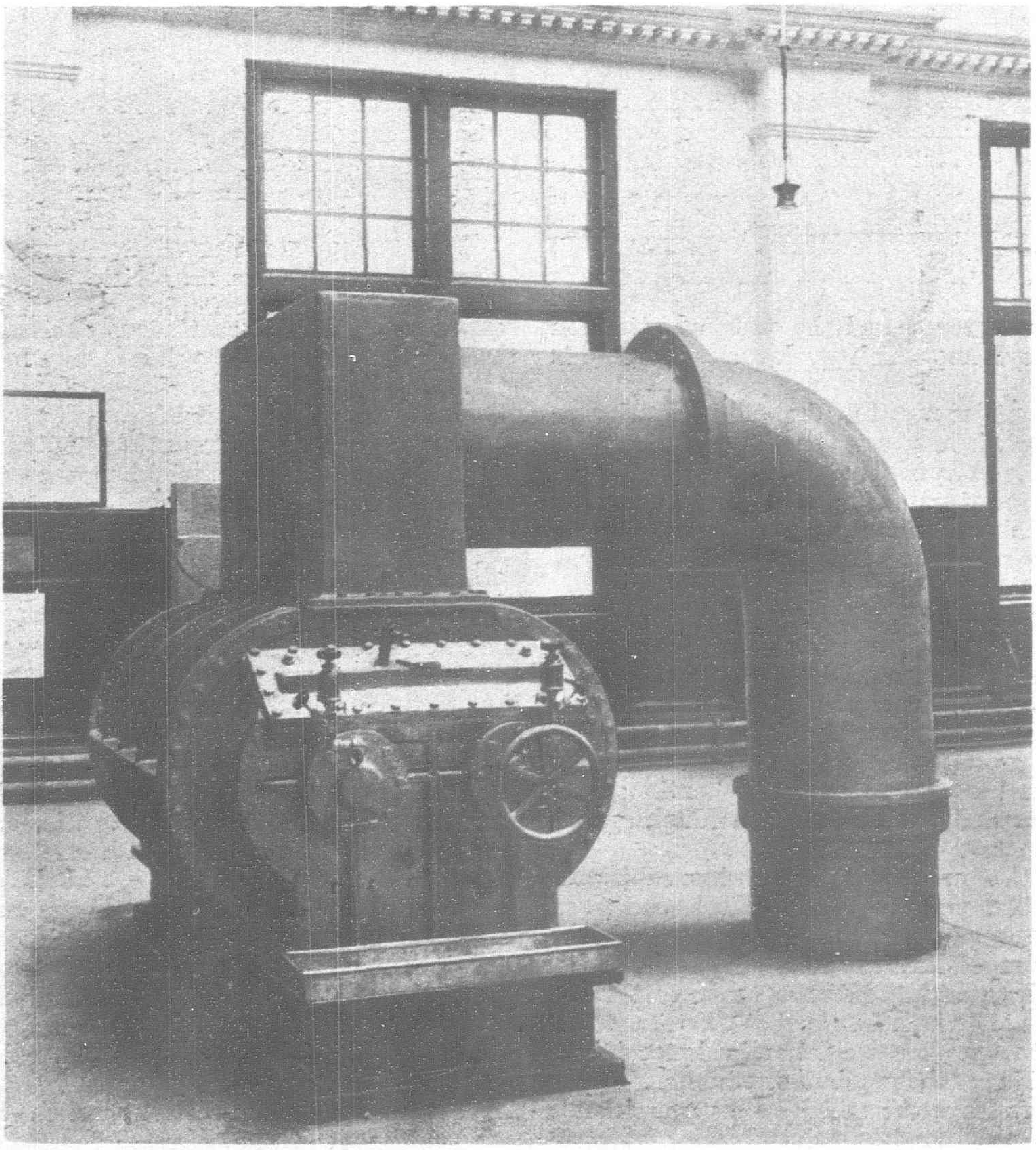


Fig. 18.—Showing Holmes-Connersville 14-in. x 42-in. Meter having a Normal Rated Capacity of 7,000,000 Cubic Feet per day

Huddersfield. It has to be borne in mind that service to the consumer demands not only that gas shall be of a composition suitable to the local requirements, and as free from impurities as is possible, but that the supply shall be dependable. The ideal supply cannot be attained when the gas carries with it on the district elements which are liable to be deposited, either in liquid or solid form, before the gas is available for consumption. It was in the year 1922 that the possibility of successful and economical removal of naphthalene from gas before distribution was first demonstrated by experiments carried out by Messrs. Holmes. To-day there are no less than about 500 million cubic feet being daily treated for naphthalene removal in their brush washers. A very considerable economy is thus secured through the resulting continuity of service, and satisfaction to the consumer.

The removal of water vapor from the gas was the next desiratum, and it was in December, 1927, that Mr. C. Harris of Taunton described, in a Paper presented to the Southern Association of Gas Engineers and Managers, his process for accomplishing this. The plant at the Taunton Gas Works was the first installed for the purpose. It was devised, in conjunction with Mr. Harris, by the staff of Messrs. Holmes, following a series of preliminary experiments at the North Shields Works of the Tynemouth Gas Company. The process may be said to be the only one in existence which has been successful, and has been extensively introduced, not only in British Works, but on the continent, in the United States of America, and other countries abroad.

After crude gas leaves the retort a considerable amount of work with respect to its purification is connected with the circumstance that water-vapor is present in the gas. It is, however, when the gas passes out of the Works that the presence of water-vapor becomes a definite danger and a nuisance. In the distribution system the gas may be exposed to millions of square feet of iron and steel, which incidentally represent a large fraction of the capital of the undertaking. This exposure may last many hours, and a very thorough final cooling and condensation therefore takes place. There is thus every condition for the promotion of the process of corrosion. Aqueous condensate, containing weak acid and saline impurities, in the presence of traces of oxygen, will attack in time any grade of iron, and will break down most known protective covering.

Effects of Corrosion

Products of corrosion are much greater in volume than the metal from which they originate, and, moreover, are not necessarily spread out uniformly. They may aggregate. A result of such corrosion is therefore a reduction in the effective area of capacity of the pipes involved. Wrought-iron or steel pipes being thinner than those of cast iron generally, become eventually perforated, unless their choking up leads to their earlier renewal. The object of drying is to prevent the formation of any aqueous condensate. Rusting of iron and steel requires primarily the presence of liquid water. This has been conclusively demonstrated by a good deal of independent investigation.

A main or service pipe which is kept dry will not collect rust deposits, and can be regarded as practically permanent. It will not therefore be subject to any reduction of effective area of gas-carrying capacity. It will always yield the maximum supply of gas to the consumer. A dry gas-meter which is free from water deposits will have a life years longer than one which is subject to the influence of water deposits. Aqueous solutions, due to water content, also act deleteriously on the leathers of the meters, tanning them to a point which destroys their flexibility.

Another important advantage of the dri-gas process is that the normal oily condensate from the gas, or an oil spray, if such be employed, will be many times more effective in a dry system of distribution, and will not proceed so quickly into syphons and thus be lost.

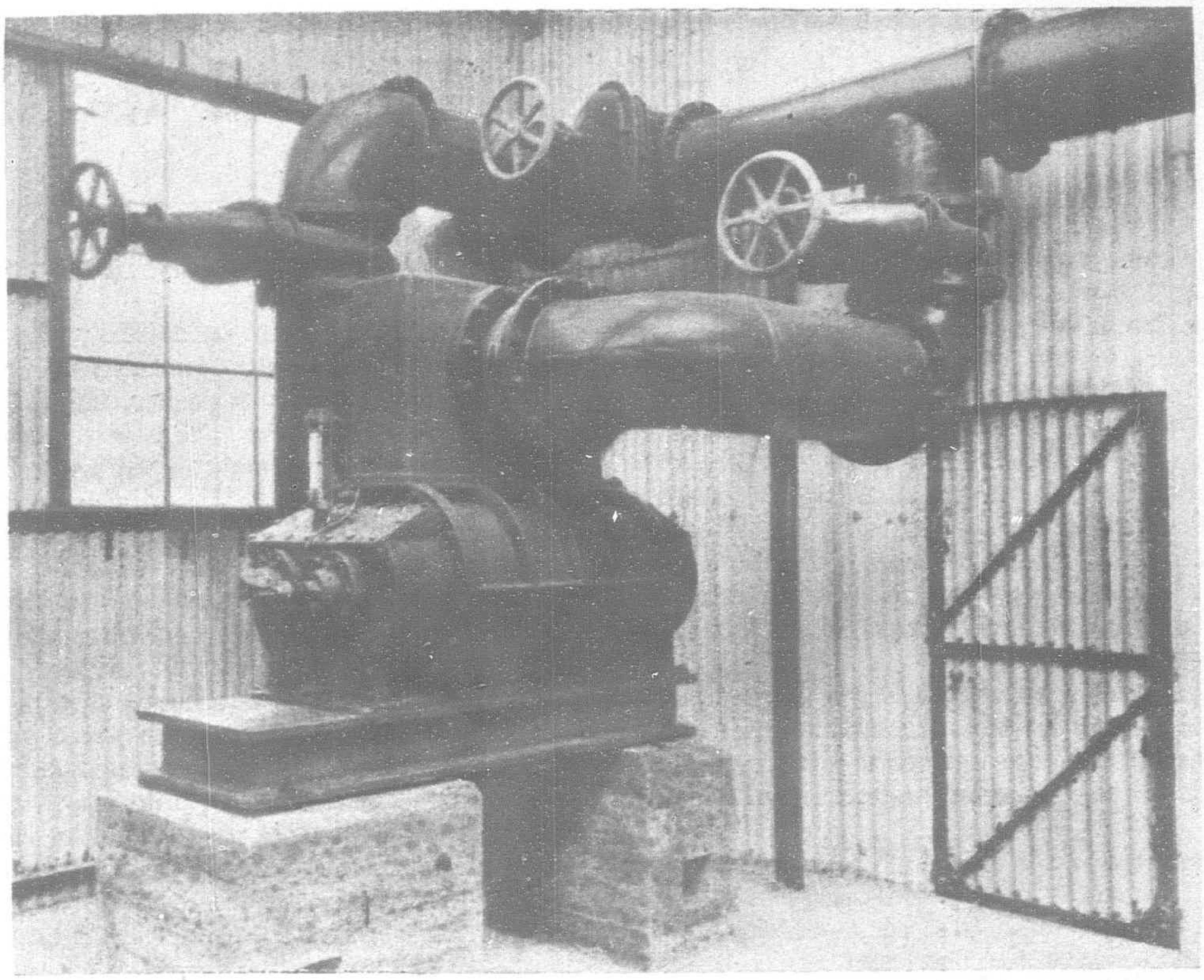


Fig. 19.—Another Holmes-Connersville Meter for measurement of Carburetted Water Gas of a capacity of 2,500,000 Cubic Feet Daily and Maximum Capacity of 5,000,000 Cubic Feet

Referring to Fig. 16 showing the Holmes combined dri-gas and naphthalene removal plant. Gas is dehydrated by contact with an absorbent (calcium chloride) in the first unit of the washer, a constant circulation being maintained by means of a pump driven by the washer engine. In passing through the washer the liquid is slightly diluted and warmed up by the absorption of the water, and, to secure reconcentration, a small quantity is continuously passed over an evaporator heated by the exhaust steam of the washer engine. In the second unit the naphthalene is absorbed by adding oil to the extent of 10 to 25 gallons per million cubic feet daily. The whole plant, it may be added, is capable of control by unskilled labor, and the daily attention needed, including oiling and greasing, does not require more than 45 minutes.

Concurrently with the adoption of the process there has been a remarkable diminution of consumers' complaints of stoppages. A survey of a large number of gas-drying plants was made which showed that the value of the saving effected capitalized represented over one-fifth of the original cost allowed. No account was taken of increased gas sales, nor of the reduced rate of depreciation of the whole distributing system.—*(Continued on page 264).*

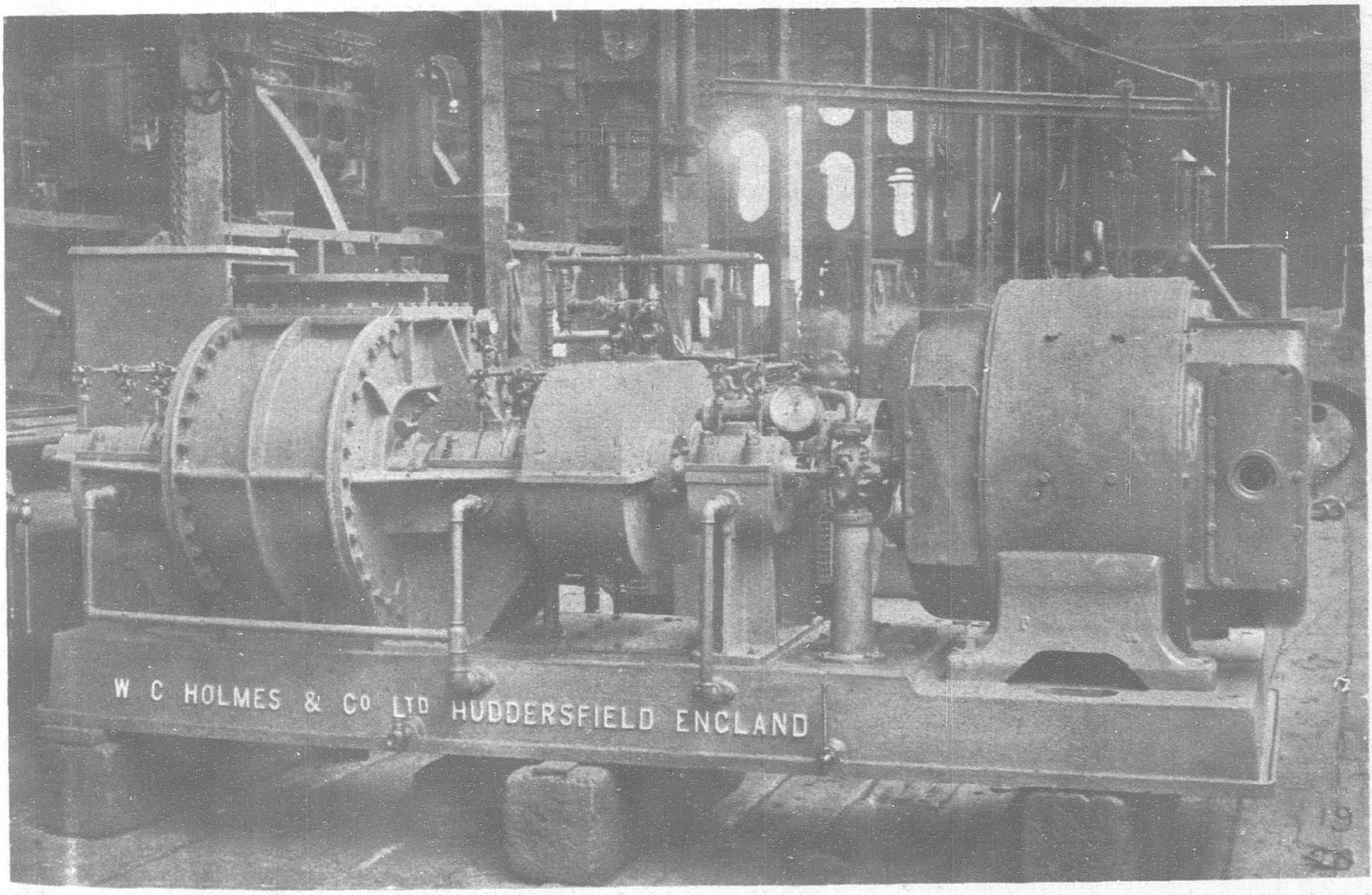


Fig. 20.—Photograph of Holmes-Connersville High Speed Electrically Driven Booster taken in Workshops at Huddersfield before Shipment to Shanghai

New Turbo Alternator is Built in England for the Shanghai Power Company*

THERE has recently been constructed in the British Thomson-Houston Company's works at Rugby, England, a 22,500 kw., 3,000 r.p.m. turbo-alternator, which is for service in the Shanghai Power Company's Riverside power station.

The turbine of this set is of the two-cylinder impulse reaction type, and is designed for use with steam at 350 lb. per sq. in. gauge pressure and a temperature of 700 deg. F. It has 18 impulse stages in the high-pressure cylinder and seven double-flow reaction stages in the low-pressure cylinder. The governing is by nozzle control, all steam up to full load passing through the first stage nozzles; for overloads the additional steam required is admitted to the entrance of the stage six nozzle diaphragm, the first five stages of the machine being by-passed.

Special precautions are taken to support the high-pressure cylinder in such a manner as to ensure that the axial center line of the casing will always coincide with the axis of the rotor, in spite of expansion or contraction of the cylinder caused by changes of temperature.

The governor end pedestal and the low-pressure cylinder adjacent to the high-pressure cylinder are provided with supporting pads set at an angle to the horizontal. The high-pressure casing has similar pads cast on, which rest on the pads cast on the pedestal and the low-pressure casing, and are free to slide on them. The planes of surface of the angular pads pass through the center line of the bearing housing and casing.

The high-pressure casing, when heated, will expand outwards in all directions along radial lines from the central point, and the flat surfaces in contact will therefore slide slightly one upon the other, thus permitting the central axis of the casing to remain fixed as regards position in space relative to the axis of the rotor. This method of construction ensures that once the gland packings provided where the shaft passes through the casing, and the diaphragm packings have worn to a definite clearance, no alteration in clearance will take place due to displacement of the casing relative to the shaft when the temperature changes.

At the steam inlet to the turbine a combined emergency trip-and-stop valve is provided, arranged for operation from the floor level. The valve is of the balanced piston type.

The valve itself is opened and closed normally by the hand-wheel. At the bottom of the valve spindle is fitted a piston which moves within a cylinder. This piston is held in its normal position at the top of the cylinder by oil under pressure, taken from the main oil supply system. The oil supply to the cylinder is under the control of the emergency trip gear. When the turbine trips out at overspeed the oil supply is diverted and the stop valve closes. Any abnormal occurrence interfering with the oil supply to the bearings of the turbine itself would also cause the stop valve to close, and thus shut down the machine before any serious damage could be done.

Incorporated in the design of the stop-valve spindle is a central by-pass valve which opens before the main valve, allowing the passing of steam for warming up the turbine and equalizing the pressure on the main stop valve.

The valve chest containing the controlling valves which adjust the steam supply to the machine is cast integral with the upper half of the steam casing, thus eliminating any joints in the steam path. Separate covers are provided for the valve chest to enable individual controlling valves to be readily removed.

The main governor is of the centrifugal type, carried on a vertical shaft, which is driven by worm and worm wheel from an extension of the turbine main shaft.

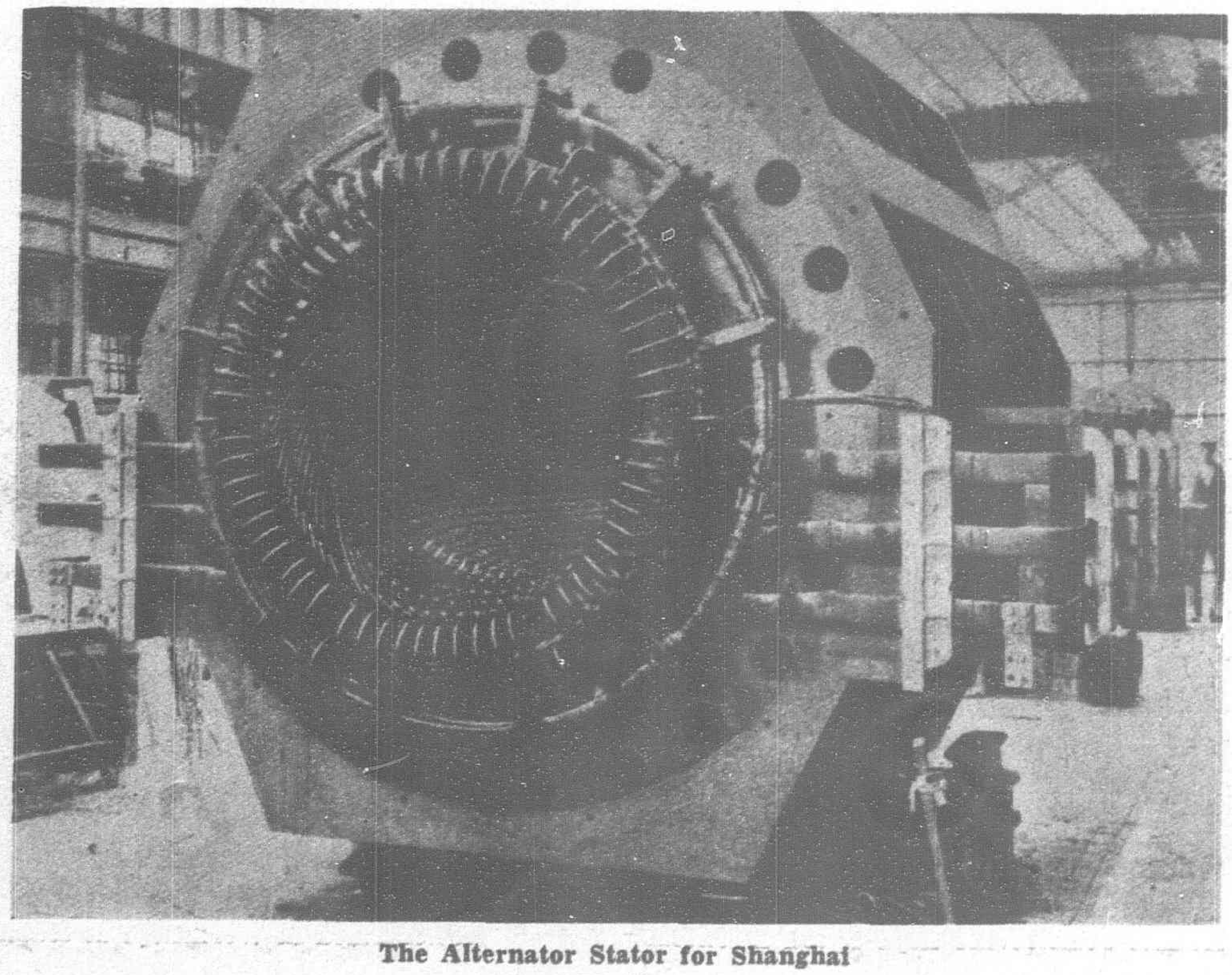
The governor does not actuate the controlling valve directly, but controls a small balanced pilot valve, which, in turn, controls the supply of oil to the servo motor, by means of which the controlling valves are hydraulically operated.

The rotating piston of the servo motor is attached to the end of the cam shaft. The movement of the governor is transmitted to the pilot valve through a floating lever to which the pilot-valve spindle is attached. One end of the floating lever is fitted to the governor lever and the other end to a rack which engages with a pinion on the servo-motor spindle on the cam shaft. Thus when the governor lever rises or falls the pilot valve moves up or down and so admits oil to one side or other of the servo-motor spindle. This causes the piston to rotate, transmitting motion to the cam shaft, and so opens or closes the necessary controlling valves.

When the servo motor rotates, the pinion on the end of the cam shaft also rotates and moves the rack up or down. This restores the pilot valve to its original position. The correct relation between the length of the steam belt and the load conditions is therefore always maintained and the speed of the turbine kept practically constant and free from hunting.

To attain stability the governor is adjusted for a small drop in speed with increase in load.

The main oil pump is also driven through a worm wheel from the same worm driving the main governor. This oil pump is of the gear-wheel type. A vertical turbine-driven auxiliary oil pump is also fitted to the machine for supplying oil during starting up and shutting down. This auxiliary turbine also functions in the event of the main oil pump failing during running of the machine. In the event of failure of the normal oil supply when running, a drop in oil pressure will automatically open the controlling valve on the turbine of the auxiliary oil pump. The auxiliary oil pump will then take charge until it is closed down by hand, or, alternatively, when the oil pressure is raised by the main oil pump coming back into operation if the stoppage is only temporary.



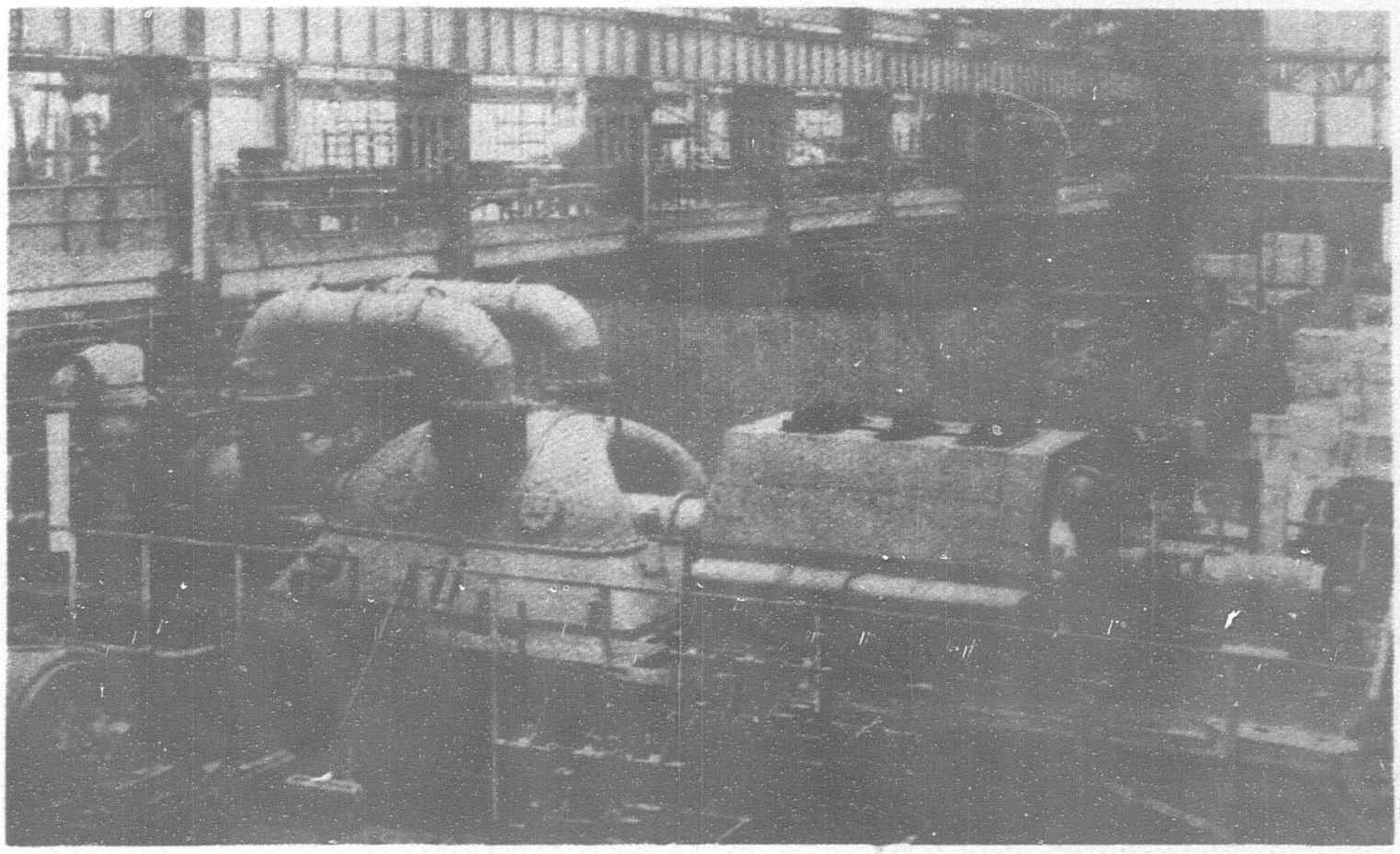
The Alternator Stator for Shanghai

High-Pressure Cylinder

The steam rotor of the high-pressure cylinder has all its discs machined solid with the shaft. The shaft-gland packings are segmental rings held in position by springs which enable the packing rings to adjust themselves to slight inequalities experienced

*Eastern Engineering and Commerce.

during running, and also minimizing wear, with consequently more efficient sealing. A Michell thrust bearing is fitted, which is adjustable from the outside of the governor end pedestal; this permits the rotor to be adjusted axially while turning. At this end of the rotor is also fitted the emergency governor for tripping out the machine on overspeed. A special feature incorporated in the design of this emergency governor enables it to be operated by oil while the machine is running under load. Oil is injected into the emergency governor ring by means of an oilcock located outside the pedestal. The weight of oil injected causes the ring to fly out and trip the emergency gear. A manually operated stop is held in position, preventing the machine from shutting down. On shutting off the oil supply the emergency trip gear is reset; by this means the whole of the emergency trip gear may be tested at any time during the running of the turbine. A clearance indicator is also fitted at the forward end of the machine, so that the axial clearance on the rotor may be taken at any time.



View of the 22,500 k.w. Turbo-Alternator under construction in the B.T.H. Company's Rugby Works for the Shanghai Power Company

The nozzles and nozzle diaphragms of the first ten stages are of the welded type. The nozzle segments are machined from bars, with all steam surfaces highly polished. The nozzle segments are inserted into half-rings and riveted and welded into position. This welded steel construction enables extremely accurate nozzle passages to be made, giving increased economy of operation. The last eight diaphragms in this cylinder are of cast-steel construction.

The steam casing is automatically drained at all points in which water could accumulate.

As the steam rotor passes through its first critical speed the outer bearing is of the spring-loaded flexible type to damp out any vibration developed while passing through this critical speed.

The coupling between the h.p. and the l.p. steam rotors is of the multi-jaw type.

Low-Pressure Cylinder

The low-pressure cylinder is of the two-flow design, that is, the steam enters at the center of the casing and the steam flow divides, half flowing each way axially. This gives a rotor balanced against endthrust. The Michell thrust block provided merely serves to locate the steam rotor axially. The rotor itself is of the built-up construction, that is, with loose wheel shrunk on to the turbine shaft.

The usual practice with machines of this type is to have each flow of steam discharging into a separate condenser. In the present case only one condenser is fitted, the exhaust opening being the full area of the exhaust casing.

As is the case in the h.p. cylinder, the whole of the l.p. cylinder is automatically drained at all points at which water could accumulate.

The l.p. rotor has a stiff shaft, that is, it does not pass through its first critical speed, therefore no flexible bearing is fitted or required. A clearance indicator is also fitted to the l.p. rotor.

The multi-jaw coupling fitted between the low-pressure rotor and the alternator rotor is fitted with limit rings to limit the axial play of the alternator rotor.

Electrical End

The alternator is designed for an output of 25,000 kva. at 90 per cent. power factor, and wound for 50-cycles, 6,600-volts.

The stator frame is of the welded steel type and consists of a number of steel rings assembled together with logitudinal steel bars both inside and outside. The stator core is built of sheet steel of high magnetic permeability, with high electrical resistance to reduce eddy current losses, and low hysteresis loss. The laminations have slots on their inner circumference to receive the stator windings. Eddy currents are reduced to a minimum by coating the laminations on each side with an enamel which is afterwards stoved.

At frequent intervals throughout the length of the core there are radial ducts which ensure that the stator iron and the embedded portion of the stator windings are sufficiently cooled.

The stator winding is of the two-layer type. The half coils constituting the top and bottom layers are formed separately and are insulated continuously from one end to the other with successive layers of mica tape, the coils being vacuum dried and impregnated under pressure with bitumen.

The finished coils are pressed to the dimensions in hot plates, so that the layers of mica form a compact insulation which excludes pockets of air.

At each end of the machine is provided a treble set of shields consisting of:—

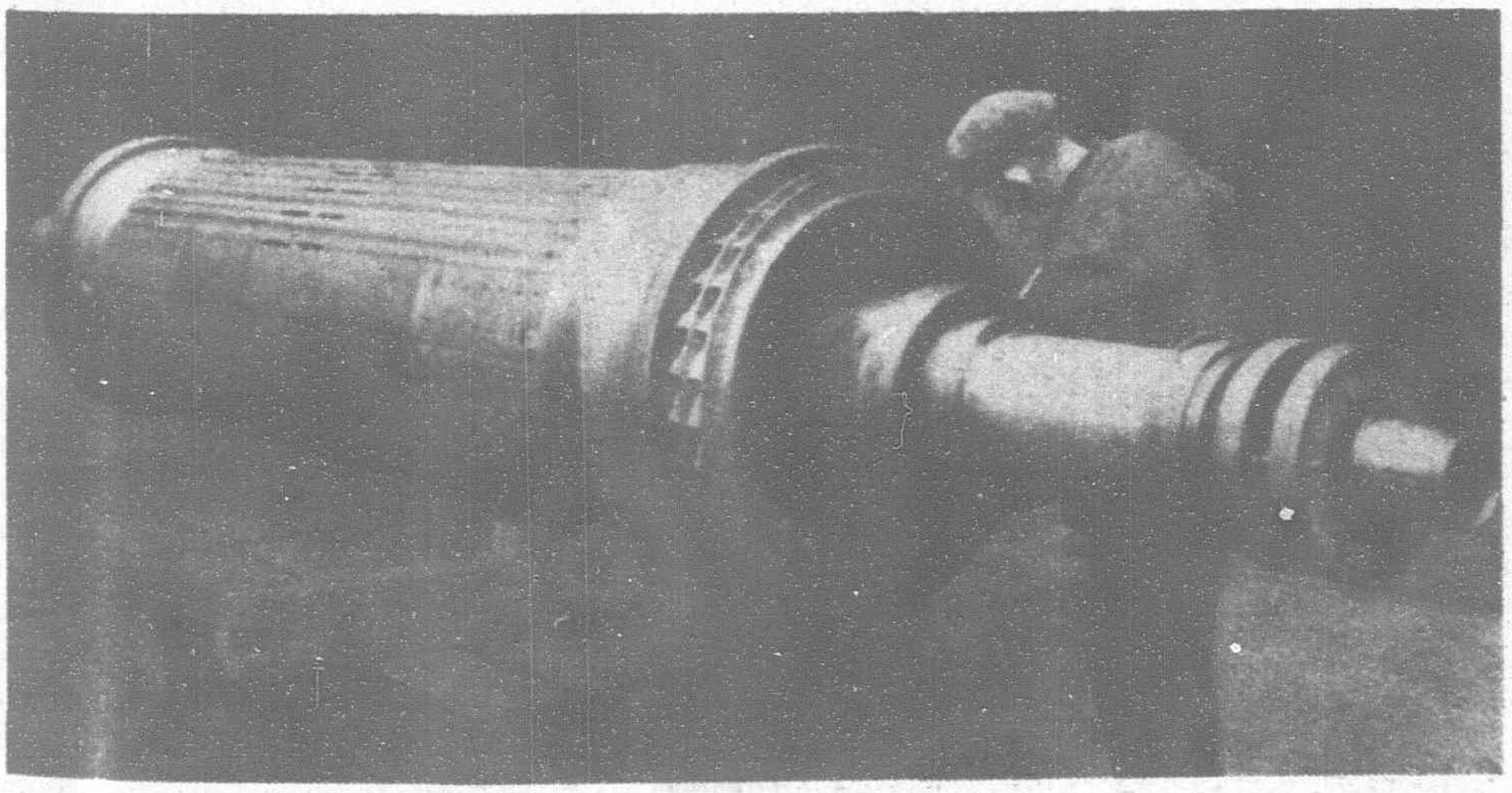
(1) Winding shield which forms a permanent part of the stator structure, and, as the name implies, affords a cover to the stator end windings.

To this is bolted:—

(2) The end shield, made in quadrants, which completes the enclosure of the stator windings and forms on the inner radius a race in which the rotor fans run with suitable clearance.

(3) The air shield, made in halves, which, with the end shield, forms the passages through which the air is conducted from the foundation into the machine.

The end shields and air shields are small in bulk and may be easily removed for inspection of the stator windings. In order that the stator leads do not interfere with the ventilating arrangements they are brought out at the side of the machine through the winding shields into a



The Electrical Rotor

sheet-iron canopy extending down the length of the stator. Three-phase leads are brought out at the exciter end of the stator and the neutral leads are brought out at the turbine end.

The rotor body and shaft is combined in one high-grade steel forging which has a central hole throughout its length so that it may be explored for forging defects. The shaft is proportioned to pass through its critical speed at about two-thirds of the running speed.

The periphery of the rotor is milled with two sets of radial slots. The larger slots receive the exciting windings and the smaller slots, placed between the larger ones, are for ventilating air to carry away the ohmic loss from the windings. The slots are closed by wedges which run the whole length of the core and are positively bonded at each end, thus forming a complete cage on the rotor surface. At the end bonding strips are provided which connect the rotor body to the retaining rings. The retaining rings are of a non-magnetic nickel-manganese steel. They are mounted on the ends of the rotor core, but are not supported from the shaft at the outer end near the bearings, and thus have to adapt themselves to the slope and flexure of the shaft at one position only.

The rotor slip-rings are of case-hardened steel. They are shrunk on to a mica-insulated steel bush which is mounted on the shaft at the exciter end outside the bearing.

The machine is self-ventilating, this being provided for by fans mounted on the retaining rings at each end. A portion of the air from these fans, after ventilating the ends of the stator windings, passes directly into the air gap and so through the stator ducts near the end of the core. The other portion passes at the back of the frame to intermediate compartments, from whence it travels radially inwards through the stator ducts on to the rotor surface. From this point it passes along the gap and finally outwards through the stator ducts with the first air stream, previously mentioned. The various air and duct spaces are amply proportioned so as to carry the quantity of air needed for keeping the machine uniformly cool.

The main flow of air is supplemented by streams which pass between the rotor end windings and the shaft, and then into the slots located between the winding slots, the alternator being ventilated by the enclosed circulating system.

The exciter is directly coupled to the end of the alternator shaft by a flexible disc coupling and is of a type which has been developed by the B.T.H. Company to ensure stability of operation under all conditions of service. It consists of a standard type or main exciter, which is mounted in the same frame, a small auxiliary exciter running at a constant voltage with a saturated magnetic circuit. This smaller exciter is used to excite the main exciter under all conditions of load.

The New Works of the Shanghai Gas Co.

(Continued from page 261)

It is interesting to remark that plants have been re-erected solely for drying the gas before it enters the holder. There has also been introduced plants for combined washing for naphthalene, employing gas oil. In other cases the gas has been dried at its exit from the holder, taking the variation in output, which normally occurs throughout the 24 hours, without perceptible loss of capacity. Local conditions often determine which of these various methods is preferable.

Station Meters

The station meters selected for installing at Shanghai are of the well-known Holmes-Connersville type, and have been made and supplied by Messrs. W. C. Holmes & Co., Ltd., of Huddersfield. It is of 14 inch by 42 inch size, having a normal rated capacity of 3,500,000 cubic feet of gas per day, with a maximum capacity of 7,000,000 cubic feet per day. The meter is fitted with a counter showing the volume of gas passed in cubic feet; and differential pressure gauge to indicate the pressure loss across the meter. Fig. 18 is from a photograph of this Station Meter; and Fig. 19 from one of the meters (also made by Messrs. Holmes) of the Holmes-Connersville type, for the measurement of the carburetted water gas produced. This is of a capacity of 2,500,000 cubic feet per day normal, with a maximum capacity of 5,000,000 cubic feet; it is of 12 inch by 36 inch dimensions.

Boosters. The boosters at Shanghai are of the Holmes high-speed type, capable of handling volumes of gas from 300,000 down to 60,000 cubic feet per hour, against a constant pressure of 4½ lb. per square inch. The boosters are electrically driven, and run at a speed of 600 revs. per minute maximum, down to 168 revs. per minute, requiring 128 horse-power maximum, down to 31 h.p. minimum. Electric current is brought from the mains at a voltage of 350, three-phase, 50-cycles, which drives a motor direct-coupled to a generator, which in turn, generates direct current for use on the motor which is direct-coupled to the booster. Fig. 20 is from a photograph of the Shanghai booster taken in the workshops at Huddersfield before shipment. The explanation of this somewhat complicated arrangement is to maintain a constant pressure of 4½ lb. per square inch electrically by the use of D.C. current of the motor driving the booster, which of course would not be possible where only A.C. is available.

The result is that, as the demand for gas on the district decreases, the pressure tends to build up, but this building up of pressure causes electrically-operated relays to come into action, reducing automatically, the speed of the motor which drives the booster. If, on the other hand, the demand for gas on the district increases, this has the effect of reducing the pressure in the main, and causes a consequent speeding-up of the booster.

Messrs. Holmes are shipping two sets of boosting equipment, each complete with its own electrical gear as described, and the gears used on the boosters for correctly timing the two impellers are of special interest, as they are of a patented type with specially long teeth, so arranged that four of the teeth in each wheel are always in working contact, thus obviating any backlash, and enabling the impellers to be set in very close proximity one to the other, thus increasing considerably the efficiency of the machine.

Note.—A succeeding supplementary article that will appear in *The Far Eastern Review* will present additional details and illustrations dealing with the new plant of the Shanghai Gas Company.

Find Iron Mine Near Mukden

A promising iron mine has been discovered on the Niuhsintai light rail line which starts from Penchihu on the Mukden-Antung line.

The mine area is believed to cover 1,200,000 square kilometers. The ore is conservatively estimated at 500,000,000 tons. Experiments disclosed that the iron content of the ores range from 69 to 51 per cent. Seams of ore are 18 feet below the surface.

The discovery is due to the efforts of Mr. Keitoku Kamishima, President the Ta Hua Metallurgical Company and famous for his invention of a special kind of steel used by the Japanese Navy. Mr. Kamishima spent 20 years searching for the deposit.

"The iron mine in question was practically discovered in 1914," Mr. Kamishima declared. "Scientific investigations were planned many times but failed as often because of limited efforts and the impossibility of obtaining an understanding with authorities under the former warlord.

"Meanwhile, Manchoukuo was established and the bandit menace reduced, enabling me to conduct thorough investigations which have led to the present discovery."

Mr. Kamishima says that the amount of iron ore required by iron works in Japan total 5,000,000 tons of which Anshan, on the S.M.R. main line, supplies 1,000,000 tons a year and Korea, 200,000 tons, the remaining 3,800,000 tons being imported from abroad.

The newly discovered iron mine is expected to produce 200,000 tons a year at first and in the future 5,000,000 tons annually.

Mr. Kamishima declares that although he discovered the mine he is not going to claim exclusive ownership of it. He said the mine is a gift to the Japanese nation which the Manchurian Incident brought about.

"A quantity of comparatively poor ore was sent to an expert in Sweden for assay purposes," he continued. "Even poor ore was found to contain more iron that I at first expected. The percentages of iron contained in middle class and rich ores are believed to be much higher."

Lessons in Aviation for the Far East

By VICTOR BERTRANDIAS

(Following is given the text of a lecture which was delivered before the Japanese Department of Communications in Tokyo on April 12 by Mr. Victor Bertrandias, Aviation Engineer with the Douglas Aircraft works at Los Angeles. While the speaker had in mind particularly the needs of Japan his words apply with equal force to China and to the entire Far East).

BEFORE stating the purpose of this paper, I want to make a few personal comments. I recall my first visit to this country, arriving in Japan on March 18, 1916, in company with the late Art Smith, known at that time as America's famous aviator. We were fortunate then in being aided by the late General Gaishi Nagaoka in our efforts to demonstrate the airplane. General Nagaoka taught us a creed of understanding of the Japanese. Through him we learned the real heart of the people, and with this feeling we left Japan. The National Aviation Society issued a book entitled " The airplane as a factor in bringing Japan and the United States closer in friendship," and in it, was expressed in very few words, the warm heart and feeling of the Japanese people towards our little troupe of foreigners.

Because of this feeling it has always been my desire to return to your land, to help, if I could, in the advancement of aviation. I have seen service in France during the World War, and have since been closely associated with the aviation industry, and by virtue of this I realize only too well the vital importance of the airplane in times of peace and war, and its relation to the national defense system of nations.

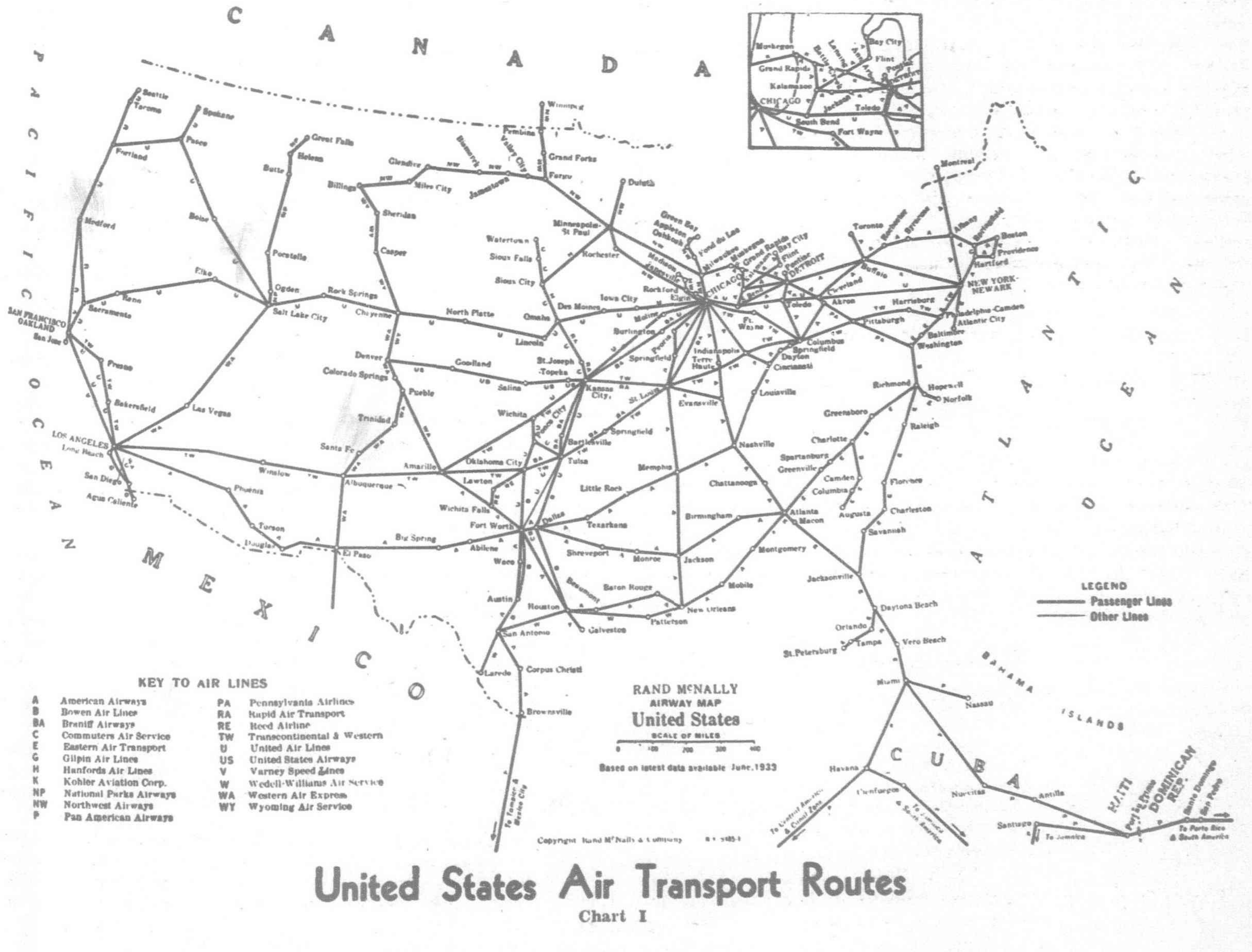
Therefore the object of this paper is to be informative, to give you an insight into the present status of air transportation, and to analyze some of the new airplane designs, so that you may fully appreciate the dynamic progressiveness with which the airplane has adapted itself to our daily life.

Transportation is one of the fundamentals of our civilized existence and speed is the most important factor, which to-day justifies the inclusion of the airplane in any co-ordinated means of transport. But while speed is the greatest asset of the airplane, it must, and always will compete with other surface means of transport, for in order to survive it must justify any increase in travel cost that speed as a rule entails. Since the Wright Brothers demonstrated to the world that man could fly—over thirty-three years ago—the maximum speed of flight and the distance of flight has increased at a rapid rate.

In 1926 the transport plane cruised at an average of 95 miles per hour. To-day, in America, the commercial airplane has reached an approximate cruising speed of 200 miles per hour. We stand, literally, in a new relationship to distance. This system of fast transportation lies in our complex as a nation for speed for the distance which separate our natural boundaries.

I trust that the information I give will be of value to the future of the aircraft industry, and will aid in Japan's progress.

Japan has made wonderful strides in the field of aviation, and its progress in this direction will be like that of many other things—very rapid.



United States Air Transport Routes

Chart I

Development of Aviation in the United States

YEAR	1921	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932
No. of routes	3	5	5	6	18	23	63	97	122	126	136
No. of operators					19	24	32	27	35	41	33
Miles of airways	3,509	2,842	3,010	2,813	8,410	9,189	16,667	36,321	49,549	50,398	48,530
Miles of lighted airways			1,472	2,045	3,149	5,745	9,302	13,800	15,258	17,512	19,500
Scheduled miles flown	1,713,934	1,545,280	922,048	5,396,672	4,608,880	5,242,839	10,472,000	20,242,891	28,833,967	43,395,478	48,344,358
Passengers carried					5,782	12,594	52,934	165,263	385,910	457,753	504,575
Mail carried (lbs.)	774,387	1,512,197	1,638,500	232,513	433,649	1,222,843	3,632,059	7,772,014	8,513,675	9,351,195	7,658,332
Revenue to mail contractors					$765,549	$2,643,454	$7,430,225	$17,042,521	$14,651,123	$19,858,869	$19,267,482
Express carried (lbs.)	123,221	208,302	71,064	185,664	6,467	12,495	35,376	197,538	286,798	885,164	1,324,428
Air mail appropriations	$1,375,000	$1,900,000	$1,500,000	$2,750,000	$3,385,000	$4,650,000	$4,150,000	$6,430,000	$13,300,000	$21,600,000	$27,000,000
Value of all aircraft products	$7,430,824	$13,142,364		$12,775,181	$17,694,905	$21,161,853	$64,662,491	$100,000,000	$38,550,000	$34,246,715	$21,996,264
Value of planes produced	$4,133,108	$7,737,069		$6,673,659	$8,871,027	$14,504,990	$43,812,318	$66,638,299	$21,469,000	$19,636,766	$12,727,215
No. of planes produced	302	587		789	1,186	1,995	4,346	6,111	3,357	2,394	1,142
Value of aeronautical exports	$472,548	$433,558	$798,273	$783,659	$1,027,210	$1,903,560	$3,664,723	$9,202,384	$8,806,396	$4,809,440	$8,710,259
No. of planes exported		48	59	80	50	63	162	354	321	140	273
No. of engines exported		80	146	73	297	84	179	321	377	318	2,175
Approved plane models						21	96	279	390	456	
Approved engine models						4	13	35	64	78	

Chart IA

The great development of the railroad system in Japan during the middle and later days of the Meiji Era, was beyond question one of the most important factors in the internal development of the country, linked as it was with a corresponding development in shipbuilding, ocean and coastwise transportation, and the development of a newspaper service. All this has contributed to Japan's progress, giving her a recognized position, and so the development of her air transportation system must take the same rapid strides to keep pace with other nations.

We have recognized Japan's advancement in the field of aviation, and we realize that as aviation interest is paramount in Japan and in America, Japan's interest is our interest, and our interest is Japan's. There are tremendous mutual benefits to be derived from aviation, both in the field of its science and progress, and in the field of social relations. Already aviation has brought nations closer together, and when people meet each other there is bound to be better understanding.

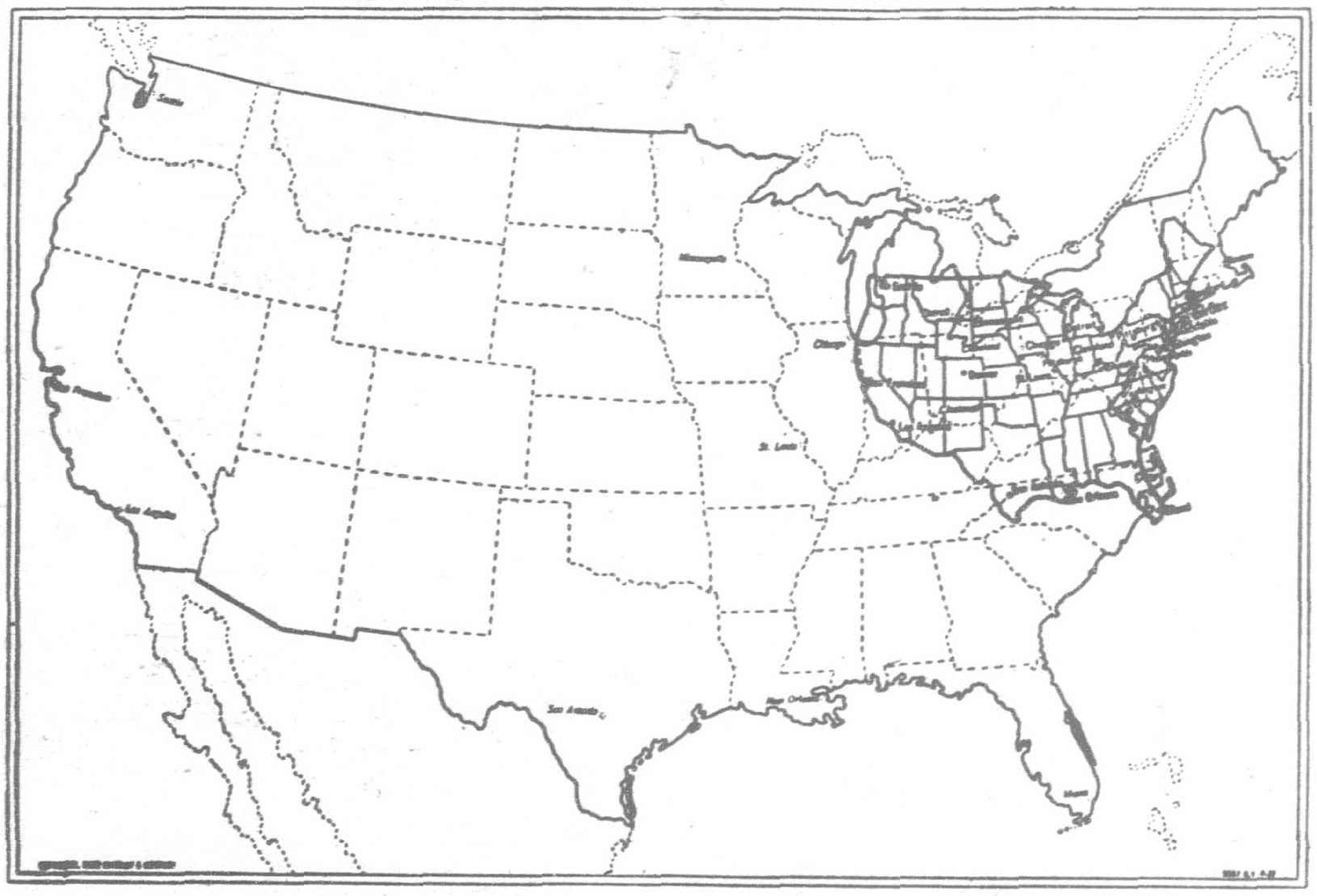
It may be difficult for some people, who have been favored with the full advantages of transportation comfort by railroads and steamships, to appreciate fully the chief advantage of air transportation, or the effect it has to-day on the economic distribution of the necessities of life and its economic factor in relation to commerce and national defense. By means of the airplane man is enabled to seek new markets, owing to the fact that time and distance for travel are greatly reduced.

Chart 1 is a map of the United States, and shows twenty-one commercial air line companies, carrying passengers, mail and freight, day and night. This bears out my statement that the time and distance for travel are greatly decreased.

Chart 2 very clearly shows how the airplane has made the United States smaller by air hours. The distance between New York and Los Angeles over Transcontinental Western Air is over 2,600 miles. The railroad time for this travel is over 76 hours. Recently the Transcontinental Western Air, with their new twin engine fourteen passenger air liner, made the trip in 13 hours and four minutes, carrying 14 passengers, two pilots, and 700 lbs. of mail and baggage. This time of 13 hours and four minutes included three stops.

The United States Grows Smaller by Air Hours

Comparison of Distances Based on Air Mail and Regular Mail Time. The distances between cities on the large map indicate distance in rail time, while the smaller map shows how flying time brings the same cities many hours closer. New York is taken as the focal point.



Air Mail and Railroad Mail Time Between Principal Cities

	BOSTON	CHICAGO	CINCINNATI	CLEVELAND	DENVER	DETROIT	LOS ANGELES	MIAMI	MINNEAPOLIS	NEW ORLEANS	NEW YORK	PHILADELPHIA	PITTSBURGH	ST. LOUIS	SAN ANTONIO	SAN FRANCISCO	SEATTLE	WASHINGTON
Boston, Mass.		**9.00** 20.15	**11.15** 21.15	**7.00** 15.00	**18.45** 50.30	**7.45** 18.00	**27.00** 90.15	**17.15** 41.00	**17.15** 33.15	**18.00** 41.15	**2.15** 5.30	**3.45** 8.00	**7.30** 16.00	**11.45** 31.15	**25.15** 58.00	**26.45** 85.00	**33.45** 87.30	**5.15** 11.45
Chicago, Ill.	**7.30** 20.00		**2.45** 7.30	**2.00** 6.15	**8.45** 27.45	**2.00** 6.15	**17.00** 56.00	**16.30** 46.30	**3.30** 10.00	**10.00** 24.00	**4.45** 17.45	**6.15** 16.45	**4.00** 8.45	**2.30** 6.30	**13.00** 32.20	**16.00** 60.30	**17.30** 61.00	**5.30** 15.45
Cincinnati, Ohio	**11.00** 24.30	**2.45** 6.30		**2.30** 5.20	**12.15** 31.20	**5.30** 5.40	**22.15** 72.45	**16.15** 34.05	**10.30** 18.00	**8.45** 24.30	**6.00** 18.20	**6.45** 16.30	**3.15** 7.40	**3.30** 7.00	**13.30** 36.00	**20.30** 73.30	**25.30** 65.30	**6.45** 13.30
Cleveland, Ohio	**5.15** 14.45	**2.15** 7.15	**2.15** 5.30		**11.45** 37.25	**1.15** 5.30	**21.30** 66.15	**17.15** 46.00	**6.30** 20.15	**11.15** 32.00	**2.30** 12.30	**4.00** 12.30	**1.15** 3.00	**5.45** 10.35	**16.15** 36.45	**19.00** 72.00	**20.45** 66.00	**3.00** 12.40
Denver, Colo.	**16.30** 50.30	**8.00** 26.15	**11.45** 35.15	**12.00** 38.15		**15.00** 33.30	**14.30** 40.00	**31.00** 61.00	**13.00** 26.30	**25.00** 47.15	**13.45** 46.25	**15.30** 47.00	**15.00** 38.45	**10.30** 23.30	**27.00** 33.15	**9.45** 39.00	**11.30** 46.45	**16.00** 46.45
Detroit, Mich.	**6.30** 19.00	**2.00** 5.50	**6.00** 6.40	**1.15** 4.15	**11.45** 36.00		**21.00** 66.30	**18.45** 44.05	**7.30** 18.50	**18.45** 39.50	**4.15** 14.30	**6.45** 14.30	**2.45** 8.00	**5.30** 12.00	**18.45** 45.20	**20.15** 67.40	**21.15** 68.10	**4.45** 16.00
Los Angeles, Calif.	**24.00** 85.30	**16.00** 62.00	**19.45** 69.30	**20.00** 70.00	**10.30** 44.00	**18.30** 68.15		**28.30** 93.30	**21.00** 66.00	**21.00** 59.15	**21.45** 82.45	**21.00** 83.30	**18.30** 75.00	**13.00** 60.30	**26.00** 43.00	**2.45** 15.00	**10.15** 44.15	**21.45** 83.30
Miami, Fla.	**21.15** 40.30	**14.30** 45.30	**12.15** 36.30	**16.00** 45.30	**35.45** 65.15	**19.15** 46.20	**38.30** 96.30		**25.30** 58.00	**17.00** 34.00	**14.45** 32.30	**14.00** 30.45	**14.15** 39.20	**13.30** 38.30	**36.30** 54.45	**38.15** 107.30	**40.00** 106.15	**12.30** 27.00
Minneapolis, Minn.	**12.15** 36.30	**3.15** 10.30	**9.30** 20.30	**6.00** 21.00	**14.45** 30.00	**5.30** 18.16	**23.00** 68.00	**20.15** 46.00		**22.45** 37.45	**9.00** 33.45	**11.45** 32.00	**10.45** 23.30	**8.00** 20.00	**16.45** 48.00	**22.15** 61.00	**26.00** 23.15	**13.00** 35.00
New Orleans, La.	**16.15** 45.00	**9.45** 24.30	**8.30** 26.00	**11.15** 32.00	**19.30** 47.20	**18.15** 29.30	**22.15** 57.00	**14.45** 32.15	**19.15** 36.00		**14.00** 34.30	**13.15** 32.45	**13.30** 35.00	**6.30** 19.15	**10.00** 21.00	**27.00** 73.30	**33.15** 83.00	**12.00** 29.15
New York, N. Y.	**2.00** 6.00	**5.30** 17.45	**6.45** 19.20	**2.45** 11.30	**15.15** 47.00	**4.45** 17.00	**24.15** 76.00	**14.00** 33.15	**9.30** 33.20	**15.00** 34.45		**.45** 2.00	**3.15** 9.00	**8.30** 23.15	**21.15** 50.45	**22.15** 82.30	**24.00** 82.45	**2.15** 5.00
Philadelphia, Pa.	**3.00** 8.00	**7.00** 16.15	**6.00** 16.00	**5.00** 13.15	**18.00** 55.30	**7.45** 16.00	**23.45** 74.30	**13.15** 31.15	**10.45** 28.00	**14.00** 33.45	**.30** 2.00		**2.30** 7.30	**7.45** 21.00	**19.15** 48.00	**24.15** 81.00	**26.00** 79.30	**1.15** 3.00
Pittsburgh, Pa.	**5.45** 17.45	**4.00** 8.45	**3.00** 7.30	**1.30** 6.00	**16.00** 38.15	**4.45** 7.30	**20.45** 67.00	**15.45** 44.15	**7.45** 21.30	**15.00** 38.30	**3.15** 9.00	**2.45** 7.45		**4.00** 13.15	**16.15** 39.45	**20.30** 72.45	**22.15** 71.15	**1.45** 8.15
St. Louis, Mo.	**10.30** 30.30	**2.30** 6.30	**9.00** 7.30	**5.15** 10.30	**12.30** 24.15	**6.00** 12.30	**14.45** 53.00	**15.15** 37.45	**6.30** 23.20	**7.00** 20.25	**8.00** 22.30	**7.15** 21.15	**4.30** 13.00		**17.45** 25.20	**20.15** 62.00	**22.00** 68.50	**7.45** 21.30
San Antonio, Tex.	**27.45** 62.30	**12.00** 41.45	**14.45** 41.30	**17.30** 40.15	**22.15** 38.15	**19.30** 41.00	**17.00** 42.30	**29.15** 54.30	**19.15** 56.45	**14.00** 19.45	**20.30** 53.30	**23.30** 51.45	**20.45** 42.45	**17.30** 28.50		**20.45** 58.00	**28.15** 91.45	**21.45** 51.45
San Francisco, Calif.	**23.00** 83.00	**14.15** 59.30	**18.30** 67.30	**17.15** 68.00	**9.00** 39.45	**16.45** 66.15	**3.30** 14.45	**31.15** 106.00	**19.15** 59.15	**31.45** 82.30	**20.00** 80.15	**22.00** 79.00	**22.15** 70.30	**19.00** 59.30	**24.00** 68.00		**6.45** 27.15	**22.15** 79.30
Seattle, Wash.	**31.00** 81.00	**16.45** 57.30	**23.45** 70.25	**19.30** 66.30	**16.30** 42.30	**20.30** 67.30	**10.30** 40.25	**32.00** 107.30	**21.00** 46.30	**21.30** 85.40	**22.15** 78.00	**23.45** 80.00	**21.15** 70.10	**26.45** 62.10	**37.00** 86.45	**7.00** 27.10		**23.00** 77.20
Washington, D. C.	**5.00** 11.00	**6.00** 23.05	**6.30** 14.00	**3.15** 11.00	**16.00** 57.00	**6.45** 15.15	**24.15** 83.30	**11.45** 28.00	**13.00** 33.45	**12.45** 30.30	**2.15** 4.45	**1.15** 3.00	**1.45** 8.00	**9.15** 21.15	**20.00** 53.00	**23.30** 82.30	**27.30** 81.00	

Time in hours and minutes. AIR MAIL time in BOLD. RAILROAD MAIL time in LIGHT

Chart II

European Air Transport Routes

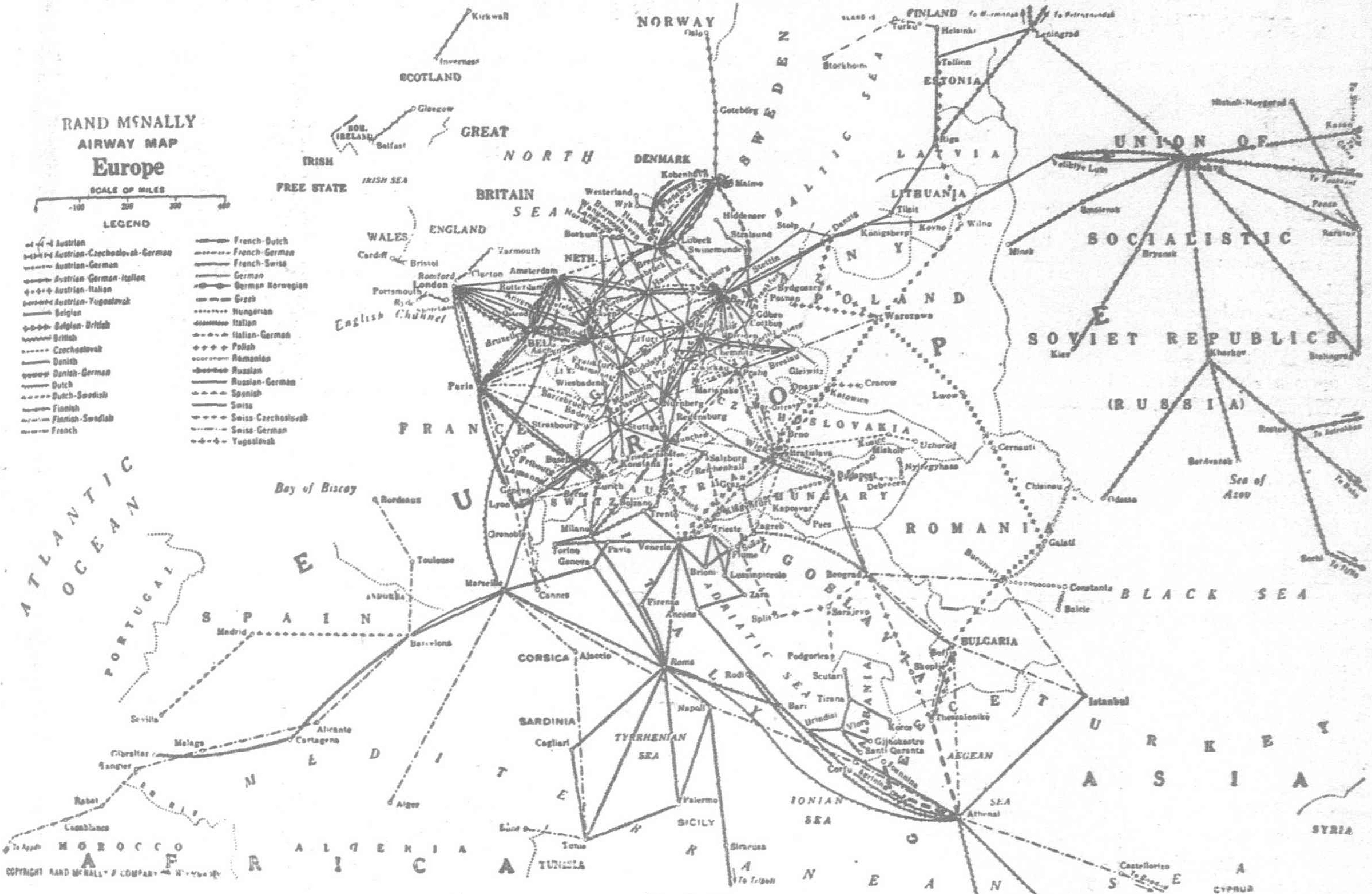
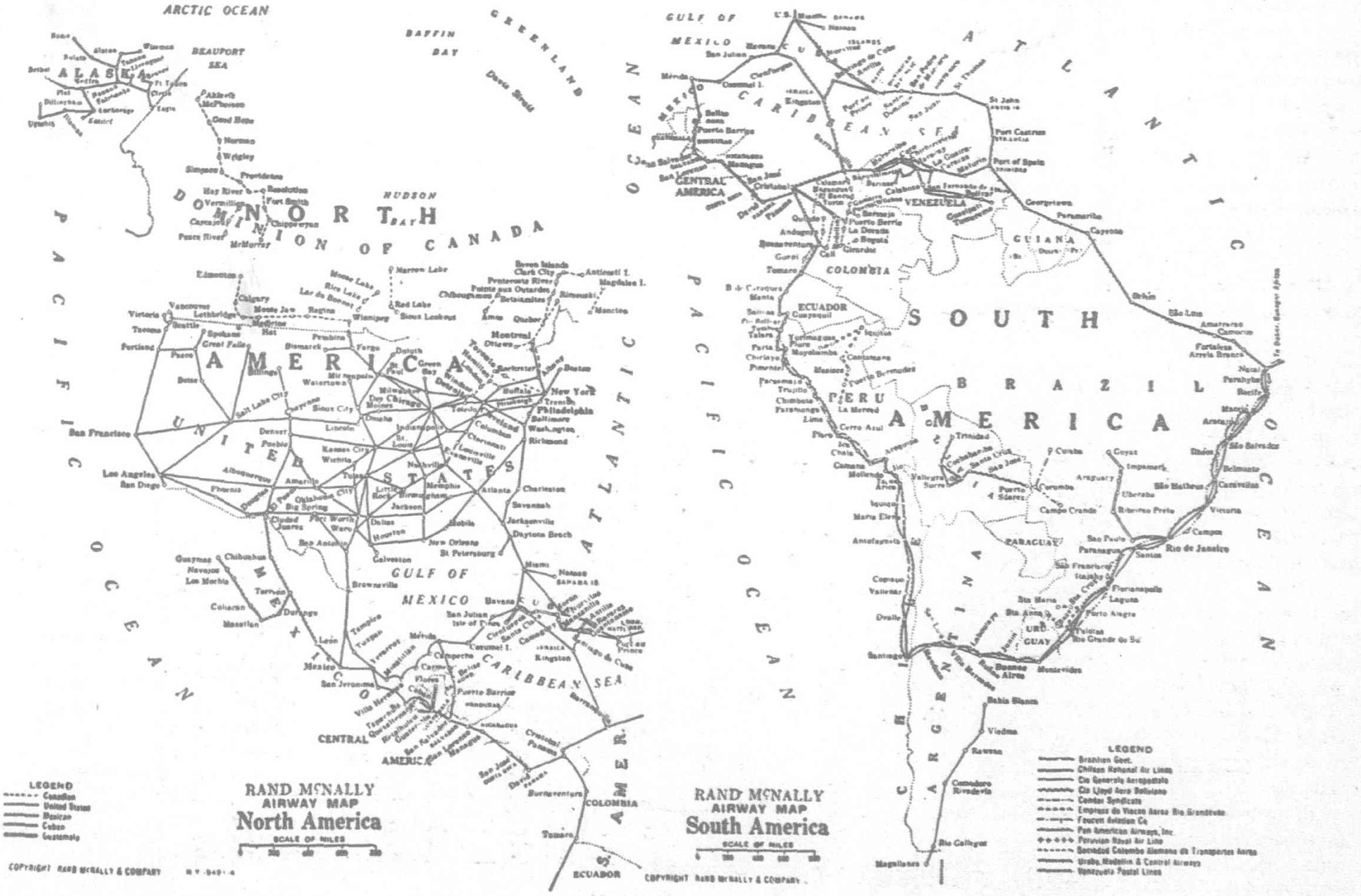


Chart IV



North and South American Air Transport Route

Chart III

The distance between New York and San Francisco is over 2,725 miles. The railroad time is 84 hours, but the United Air Lines are now flying this distance in 20 hours.

It must be remembered that both of these companies operate over mountainous country, which requires them to fly at high altitudes and under all sorts of weather conditions, day and night.

In the United States, South America, and Europe, a complete system of air transportation is in operation.

Chart 3 shows clearly the chain of air lines in North and South America.

Chart 4 shows a spider web of air lines covering thousands of miles throughout Europe.

Chart 5 describes Asian, African and Australian air transport routes.

Chart 6 shows the comparative development of aviation in leading countries, indicating the number of miles flown by leading nations, in thousands and millions of miles. You will note that A-7, representing the United States, leads all other nations except in 1922, 1923, 1924 and part of 1927, with Germany, France, but all in the million of miles.

We find the curve for Japan has made a steady climb since 1927. But on the chart showing air passengers carried by leading nations, Japan's advance has not been as rapid. This condition can only be charged to the lack of expansion in air lines. The number of air miles flown and the passengers carried by the leading nations, is sufficient to prove the importance of the aviation industry. Its magnitude now and in the future must be realized by you, and demands the support of the government in the development of the commercial industry.

The development by Japan of its commercial air lines is most important, and is imperative to the defense system of the nation. Air transports are essentially a part of your air force, to be mobilized in times of emergency just as are your railroads and other means of transportation. The airplane also serves for the rapid transportation of supplies, personnel, staff officers, sick and wounded. Therefore commercial aviation takes its place in the transportation system, and is indispensable to your national defense.

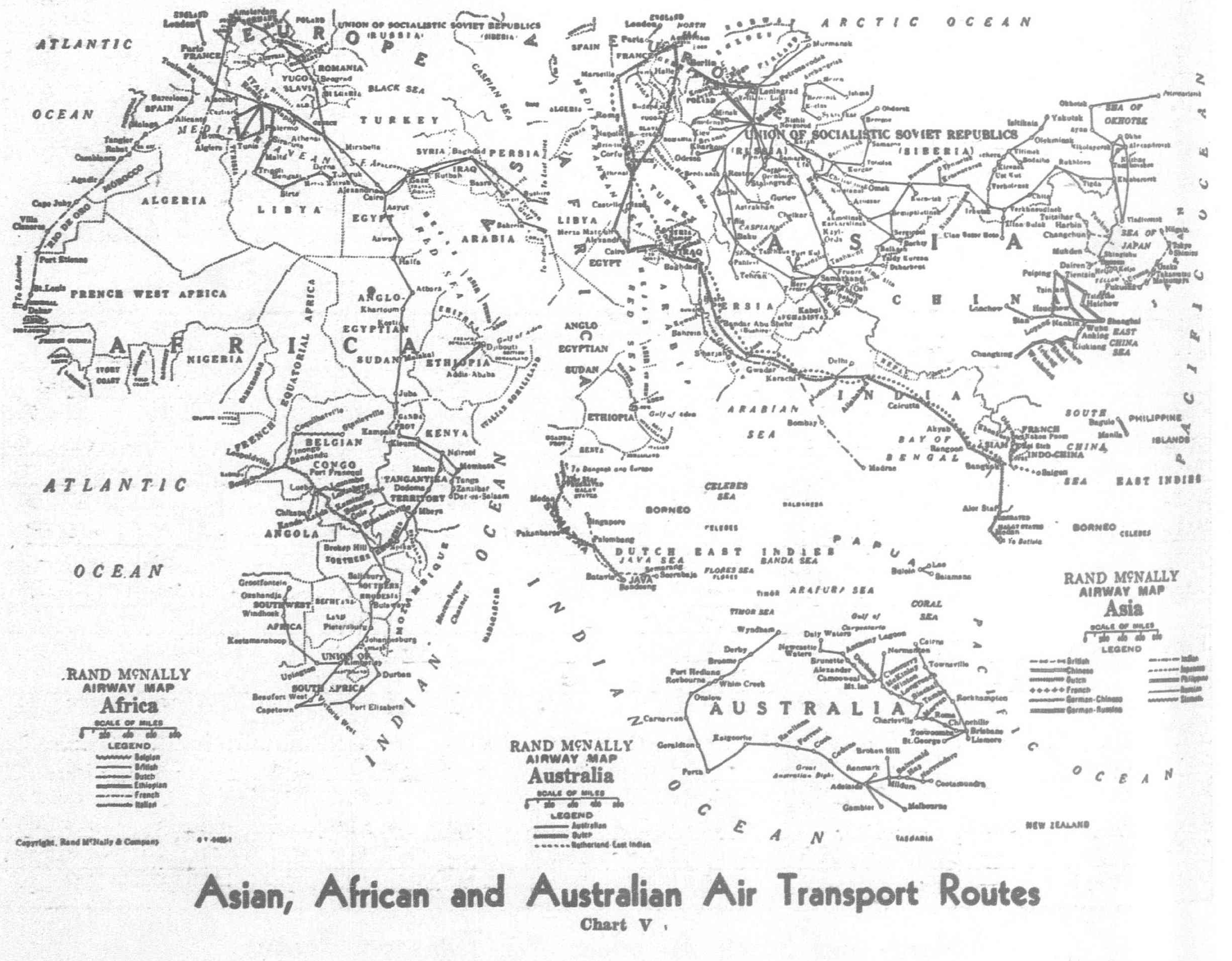
If there is political unrest in any part of the world, it is necessary for Japan to be supplied with adequate aerial defense and personnel. Without question the airplane is bound to be the most powerful factor, or the decisive factor, in any war of the future, and to-day nations financially burdened are finding ways of building up their air forces, military and commercial.

Whatever factors are responsible for Japan's aviation policy, they should without further hesitation bring about the expansion of the air lines.

Japan stands well in the principal techniques of aviation, but in order to maintain a manufacturing industry and to lower the cost of production in manufacture, it is absolutely necessary to improve the industrial organization.

The economic structure of any country, in relation to its industrial organization, demands planning in the output of manufactured articles. This is also true in the case of the airplane. No country can continue to build military aircraft without reaching a limit, especially in times of peace. If there is no development of commercial aircraft, what can be done to maintain the manufacturing industry?

Commercial aviation in the United States has contributed much to our national defense system, in that we have retained our engineering staffs and men highly specialized in the art of manufacturing. For example, in America, at the time of the Armistice, there were twenty-four aircraft and aircraft engine companies, with a total capitalization of nearly 22 million dollars.



Asian, African and Australian Air Transport Routes

Chart V

Comparative Development of Aviation in Leading Countries

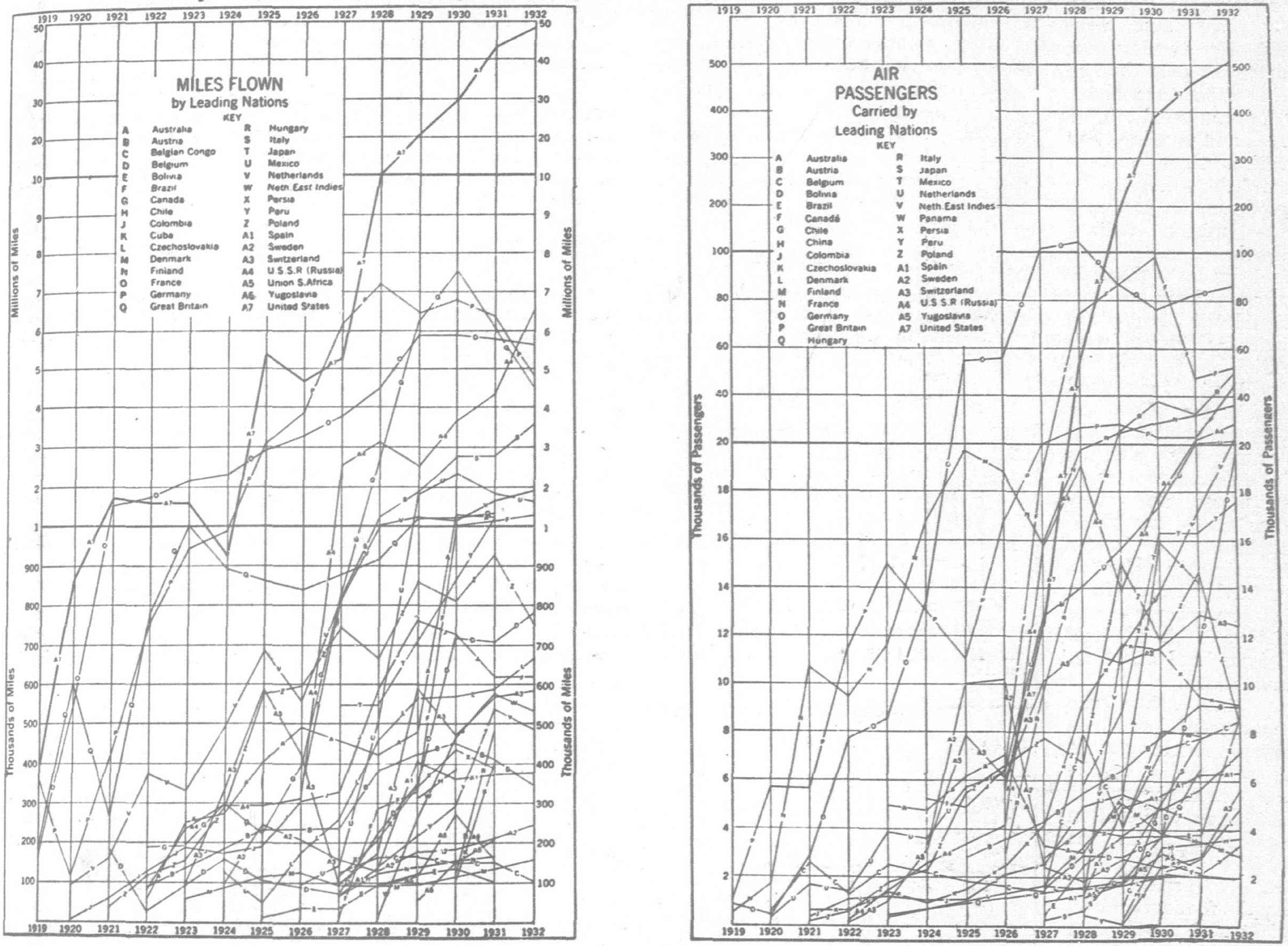


Chart VI

First Six Months	Production						Percent Value 1933 Compared with	
	1931		1932		1933			
	Units	Value	Units	Value	Units	Value	1931	1932
Comm.Airpl.	982	$3,844,391	326	$1,408,274	277	$ 3,305,014	-14.0%	+135. %
Comm.Eng.	1358	2,500,542	333	922,480	560	2,407,161	- 3.7%	+161. %
Total Comm.	---	$6,344,933	---	$2,330,754	---	$5,712,175	-10.0%	+145. %
Mil.Airpl.	471	6,837,691	315	5,215,587	276	5,919,826	-13.4%	+ 13.5%
Mil. Eng.	971	5,409,287	691	4,095,512	524	3,078,411	-43.1%	-24.8%
Total Mil.	---	$12,246,978	---	$9,311,099	---	$8,998,237	-26.5%	- 3.4%
GRAND TOTAL	---	$18,591,911	---	$11,641,853	---	$14,710,412	-20.9%	+ 26.0%
	Deliverios							
First Six Months	1931		1932		1933		Ditto	Ditto
	Units	Value	Units	Value	Units	Value		
Comm. Airpl.	941	$4,196,727	417	$1,526,355	289	$3,332,657	-20.6%	+118. %
Comm. Eng.	1327	2,760,407	354	949,630	581	2,405,371	-12.8%	+153. %
Total Comm.	---	$6,957,134	---	$2,475,985	---	$5,738,028	-17.5%	+132. %
Mil. Airpl.	471	6,886,191	324	5,361,020	278	5,605,700	-18.6%	+ 4.6%
Mil. Eng.	1012	5,774,718	682	4,004,462	531	3,116,611	-46.0%	-22.2%
Total Mil.	---	$12,660,909	---	$9,365,482	---	$8,722,311	-31.1%	- 6.8%
GRAND TOTAL	---	$19,618,043	---	$11,841,467	---	$14,460,339	-26.3%	+ 22.1%

Chart IX

They were organized to produce 20,000 airplanes in less than a year, and were actually turning out more airplanes than all the allies combined. They employed 175,000 men and women. But within three months after the Armistice the government cancelled 100 million dollars' worth of war orders, and as a result the aircraft business was liquidated and the industry faced with ruin.

But far-sighted leaders recognized the potency of aircraft for commerce as well as for war, and took steps to assure its peace-time development and application. Various investigating boards found that the aviation industry was an essential part of the national defense, and must be maintained.

Since then the government has given every encouragement it could provide. The Air Commerce Act of 1926 was designed in conjunction with the policies of the Post Office Department to lay the foundation of a great nation wide civil aeronautic system. Its aim was to bring into being a commercial air transport system for mail, express service, and passengers, to take its place among the already established transportation systems, for the improvement of our national life and welfare. Its administration and application of funds by the Post Office Department have been marked with such success that to-day the United States has the most efficient, progressive, extensive, and active air transport system in the world.

American Air Transport Lines
Statistics of the Month

1933	Pounds Air Mail	Pounds Air Express	Miles Scheduled	Miles Flown	Percent Scheduled Miles Flown
January	549,157	102,440	4,367,548	3,854,472	83.3%
February	517,390	111,573	3,902,352	3,498,874	89.7%
March	609,770	146,777	4,301,250	3,828,097	88.9%
April	593,280	133,767	4,296,691	3,987,381	92.6%
May	635,662	156,913	4,463,803	4,228,803	94.7%
June	666,449	161,883	4,537,636	4,478,908	98.7%

1933	Passengers	Passenger Miles	Gallons Gasoline	Gallons Oil
January	30,327	9,930,799	1,904,323	54,162
February	28,513	9,563,810	1,724,288	49,726
March	31,778	10,340,985	1,901,351	54,084
April	37,906	11,155,227	2,044,501	59,595
May	45,061	14,311,801	2,161,198	63,457
June	55,490	17,974,957	2,222,552	66,887

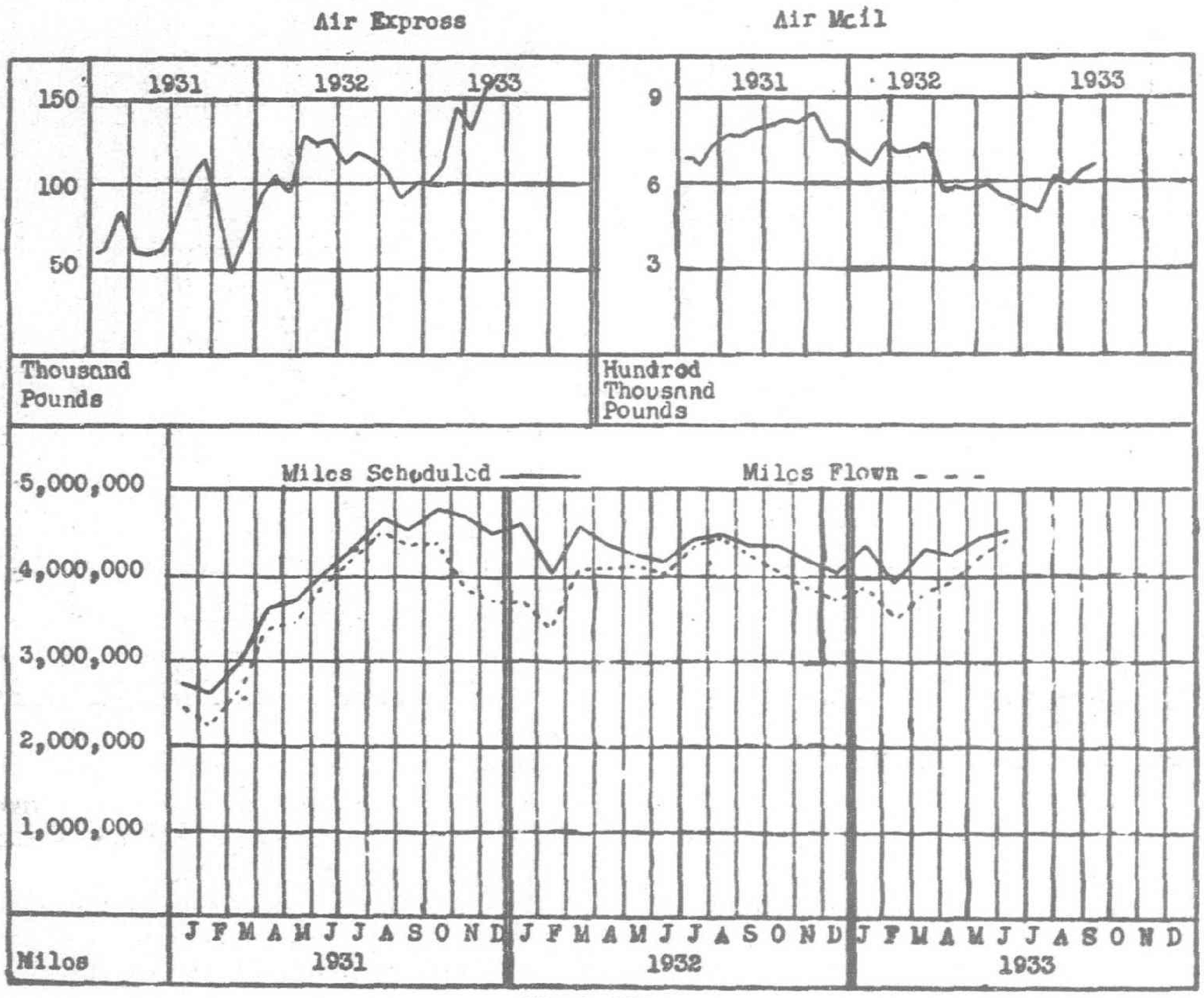


Chart VIII

Chart 7 shows the comparative development of leading nations in air mail and air freight. The curve for the United States on air mail poundage proves the points I have mentioned. It describes Japan's position in air mail carried. France, Germany, Great Britain, and Canada, held their position regarding air freight carried, but from 1928 onwards America has steadily climbed, and in 1933 passed all other nations.

In the first nine months of 1933 the best gain was made by air express, which showed 1,278,797 pounds for that period, compared with 1,019,973 pounds, or 25.4 per cent more than the corresponding period of 1932. Air express, unknown in 1926, reached the figure of 1,660,000 pounds in 1933.

In the last two years there has been a very small amount spent in military aviation, and due to the already developed air lines it was possible to make new designs of commercial transports, for the already established transport business required new equipment to meet the demands of travel and increased cargo and mail.

The Department of Aeronautics statistics show that the total air line mileage for 1926 was 11,830 miles per day, whereas it was 158,537 miles per day in 1933.

Some 70-odd air planes were used in 1926 over schedule air lines, but more than 650 were in service in 1933. Mail poundage increased from 435,000 pounds to 7,665,000 pounds.

The number of passengers increased from 5,782 in 1926, to well over half a million in 1933. This last figure represents close on 4 per cent of the total of railroad pullman passengers of the country, a fact which is recognized by the railroads with alarm.

Chart 8 gives an idea of the increase and volume of the American air transport lines statistics for the first six months of 1933. At the end of nine months in 1933 a total of 415,323 passengers had been carried.

Chart 9 gives some idea of the production and deliveries for the first six months only of 1931, 1932 and 1933.

The last six months of 1933 finds the industry manufacturing over 150 large type twin engine transports, at an approximate value of 10 million dollars.

The total value of commercial aircraft and engines during the first ten months of 1933 was $9,842,331 compared with $3,932,171 for the first ten months of 1932 a gain of 150 per cent.

Chart 1A shows the development over a period of eleven years.

One of the most outstanding contributions to the efficiency of our commercial air line operations has been made through the aid of other established laboratories, the perfecting and efficiency of instruments, radio communications for weather reports, two-way telephone system, radio beam lighted airways and fields.

Chart 10 shows the Department of Communications aeronautical radio communication stations, which increased to 70 in number during 1932, and furnished complete weather information by radio-telephone broadcasted to pilots.

Chart 11 shows the Department of Commerce radio range beacons. The number of radio range beacons which project radio beams for the guidance of aircraft at all times was increased to 94 during the year, including 20 new type marker beacons, to facilitate direction and communication in bad weather.

There were 19,500 miles of federally lighted and radio equipped airways in operation at the beginning of 1933, including three transcontinental routes.

Chart 12 gives a general idea of the air lines provided with two-way radio equipment.

There has been considerable discussion regarding the merits of tri-motored airplanes and twin engined airplanes. The trend of design for single engine and twin engine airplanes has definitely proved superior for the monoplane. Transcontinental and Western

Comparative Development of Aviation in Leading Countries

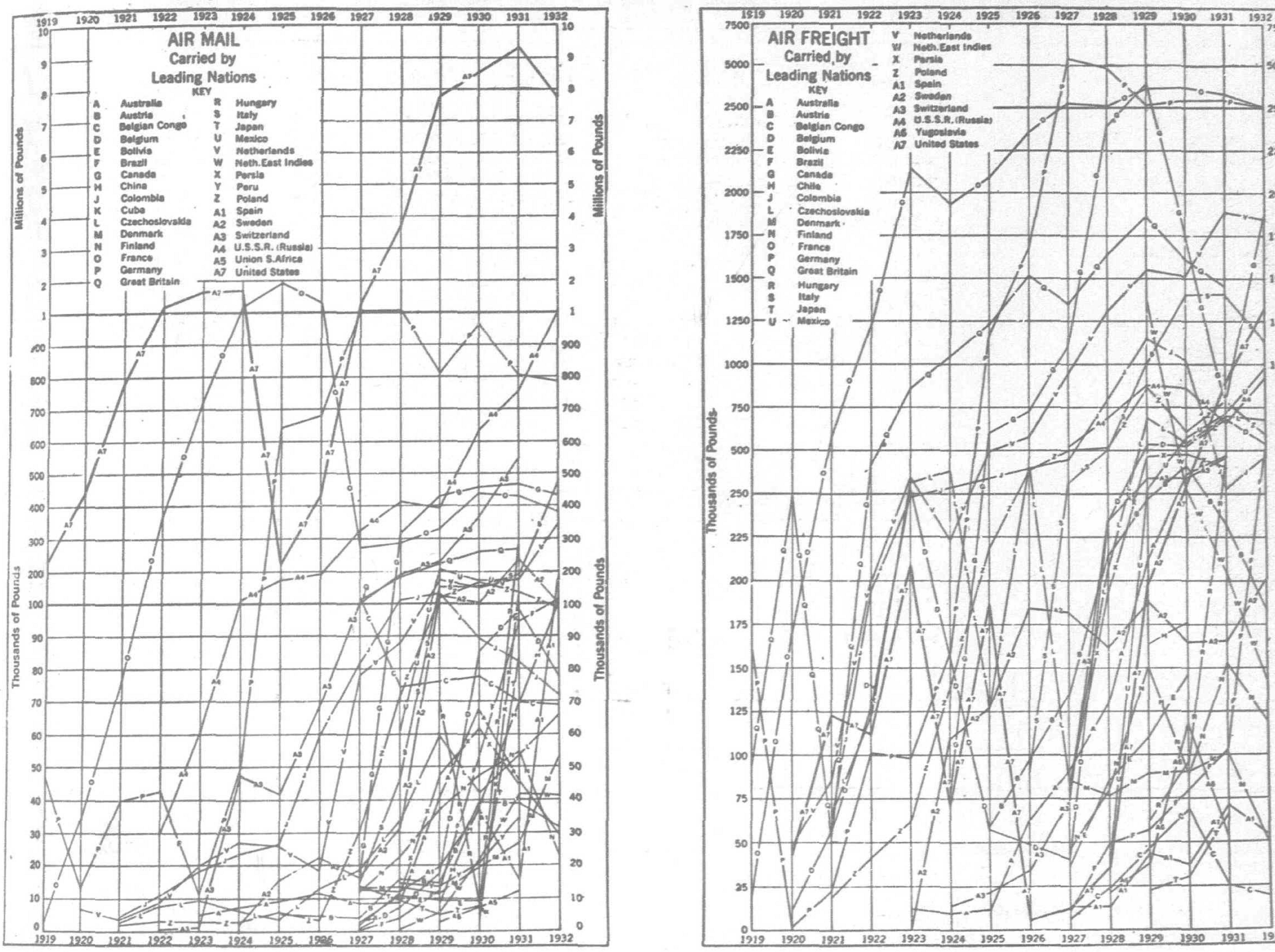


Chart VII

Air Express have operated tri-motored airplanes. But after extensive tests recently, they have placed orders for 40 twin engine, fourteen-passenger all metal air transports.

The United Aircraft-Boeing air lines have had under construction 60 twin engine airplanes of a slightly less horse-power than those ordered by the Transcontinental Western Air. American Airways have ordered 12, Pan American six in addition to the Army and Navy who operate their own transport squadrons.

The decision of all these companies to adopt twin engine airplanes, after years of experience with the tri-motor airplane, was based on sound economy, and the fact that the twin engine airplane demonstrated its efficiency and satisfactory performance over mountainous country with a full load up to 17,500 lbs.

It demonstrated its ability to climb and continue flight on one engine. Even Mr. Fokker, who has been a strong advocate of tri-motored airplanes, acknowledges the superiority of the twin engine airplane, and has acquired the right to manufacture the Douglas transport in Europe.

The technical staff of the Transcontinental Western Airlines conducted test flights on the Douglas air transport during September, 1933. This airplane was equipped with two F 31820 geared super-charged engines developing 700 h.p. each at 7,000 feet, after exhaustive tests which many experts in aviation believed it impossible to pass, particularly the single engine test, which was made by Transcontinental Western Air and not by the manufacturer.

A single engine take-off was made at Winslow, Arizona (4,500 feet above sea level). This country is very mountainous. During the test the pilot shut off one engine after the plane had travelled the length of the runway, but the airplane continued its take-off and climbed to an altitude of 9,000 feet, where the pilot levelled off and flew over the Continental Divide mountains at a speed of 120 miles per hour on one engine, from Winslow, Arizona, to Albuqurgue, New Mexico, 240 miles distance. This test was made with a full load of 17,500 lbs.

The twin engine airplane is more economical from the operator's point of view, be it commercial or military, on account of the reduction in weight of one engine as against the tri-motor, the saving in the cost of one engine propeller, and necessary equipment for installation. It also gives better visibility for flying, and increased range and increased payload, while there is a reduction in maintenance and overhaul, and a saving of supplies necessary for the third engine. This saving alone is important when considering the cost and idle investment. All this has direct influence on the cost per mile.

I believe this explanation will satisfactorily answer any doubt that exists regarding tri-motor or twin engine airplane.

In addition the twin engine airplane in question has also demonstrated many other features, first slow landing with the use of wing flap, second ability to fly level flight with one engine off, by the use of a small aux flap on the aileron and a small aux flap built in the rudder.

The next step in the design of large transports, land or water, may be in the direction of four engines, when the demand of travel, mail and cargo warrant such an investment. The trend and desire of transport companies to-day is to link up the whole world by a system of air lines.

Therefore Japan must take her position in this development.

The necessity for air transportation is apparent, apart from supporting the manufacturing industry. It is necessary to take into consideration the topography of the country. The islands of Japan, extending as they do for 1,200 miles in length, including Hokkaido, and the greater distances to Formosa, can easily be reached by airplane. The same is true of Korea and Manchoukuo.

Government Aids to Navigation

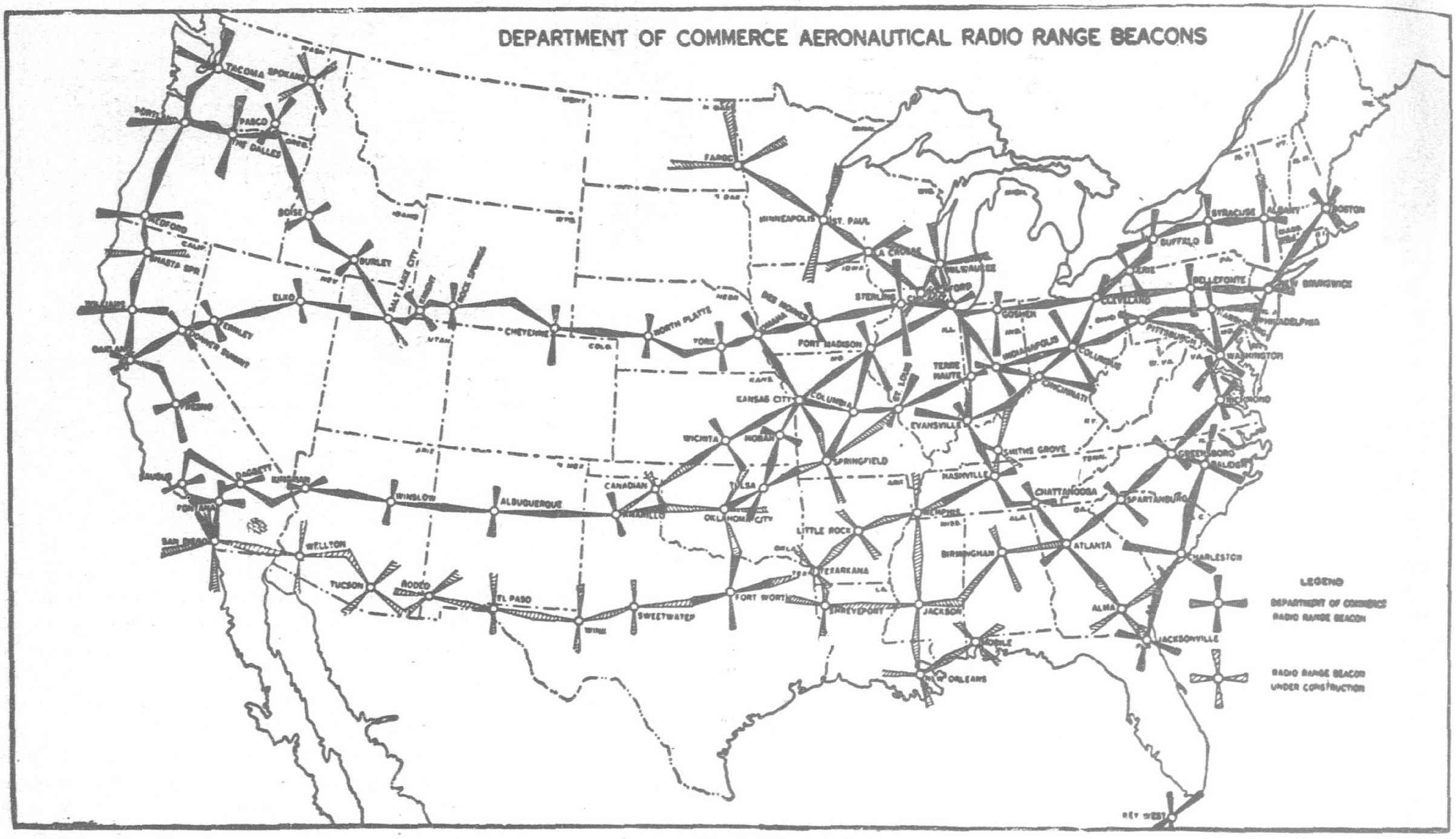


Chart XI

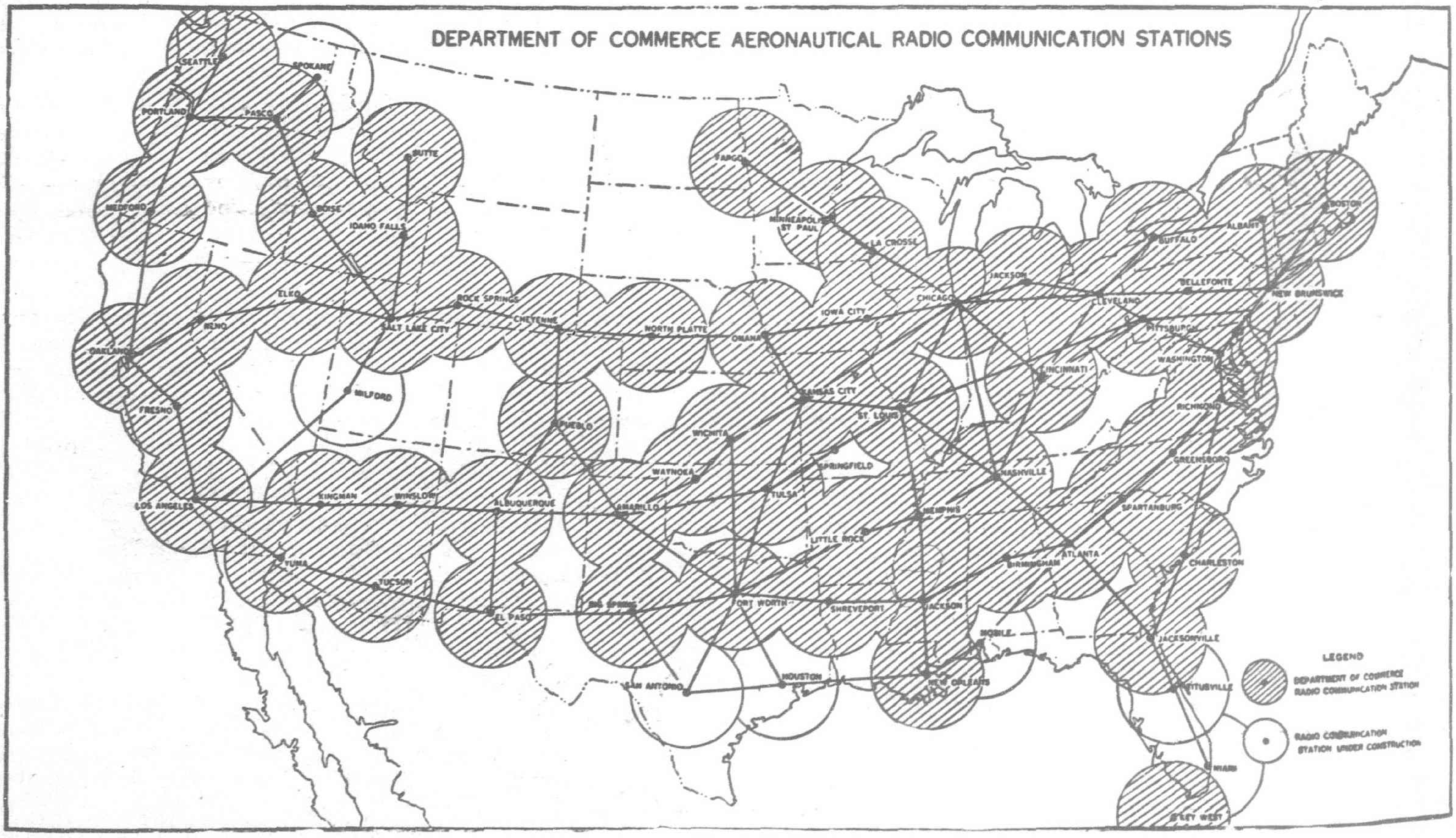


Chart X

There were 19,500 miles of federally lighted and radio equipped airways in operation at the beginning of 1933, including three transcontinental routes. Experiments conducted during 1932 proved the practicability of the transmission of weather maps by means of teletypewriter circuits. Further tests also were conducted on a radio-operated teletypewriter service, with marked success.

Airways radio communication stations, which increased in number to 70 during 1932, furnished complete weather information by radiotelephone in frequent broadcasts to pilots. The number of radio range beacons, which project radio beams for the guidance of aircraft at all times, was increased to 94 during the year. A new type marker beacon was developed, 20 of which have been installed, to facilitate direction and communication in bad weather.

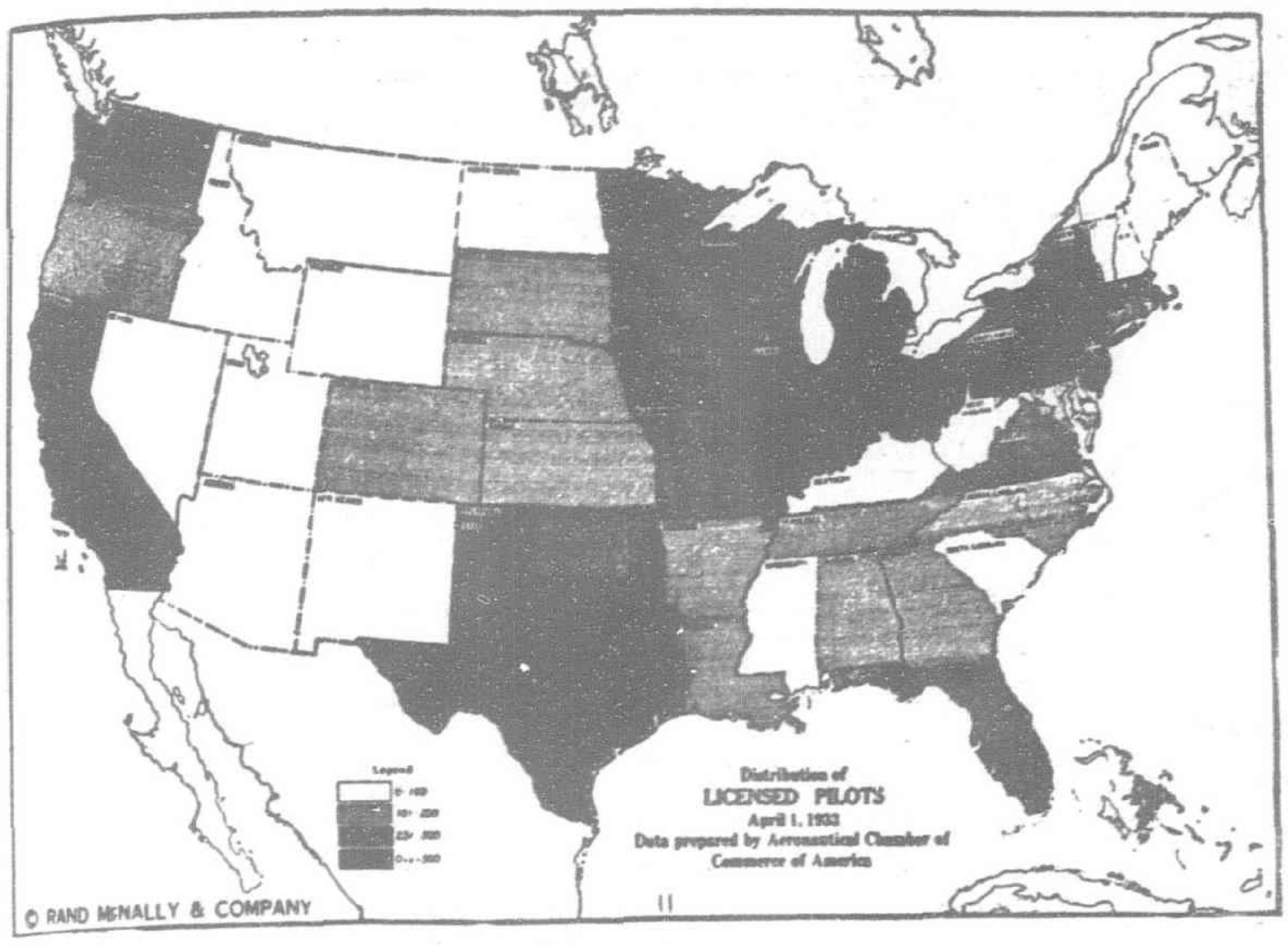


Chart A

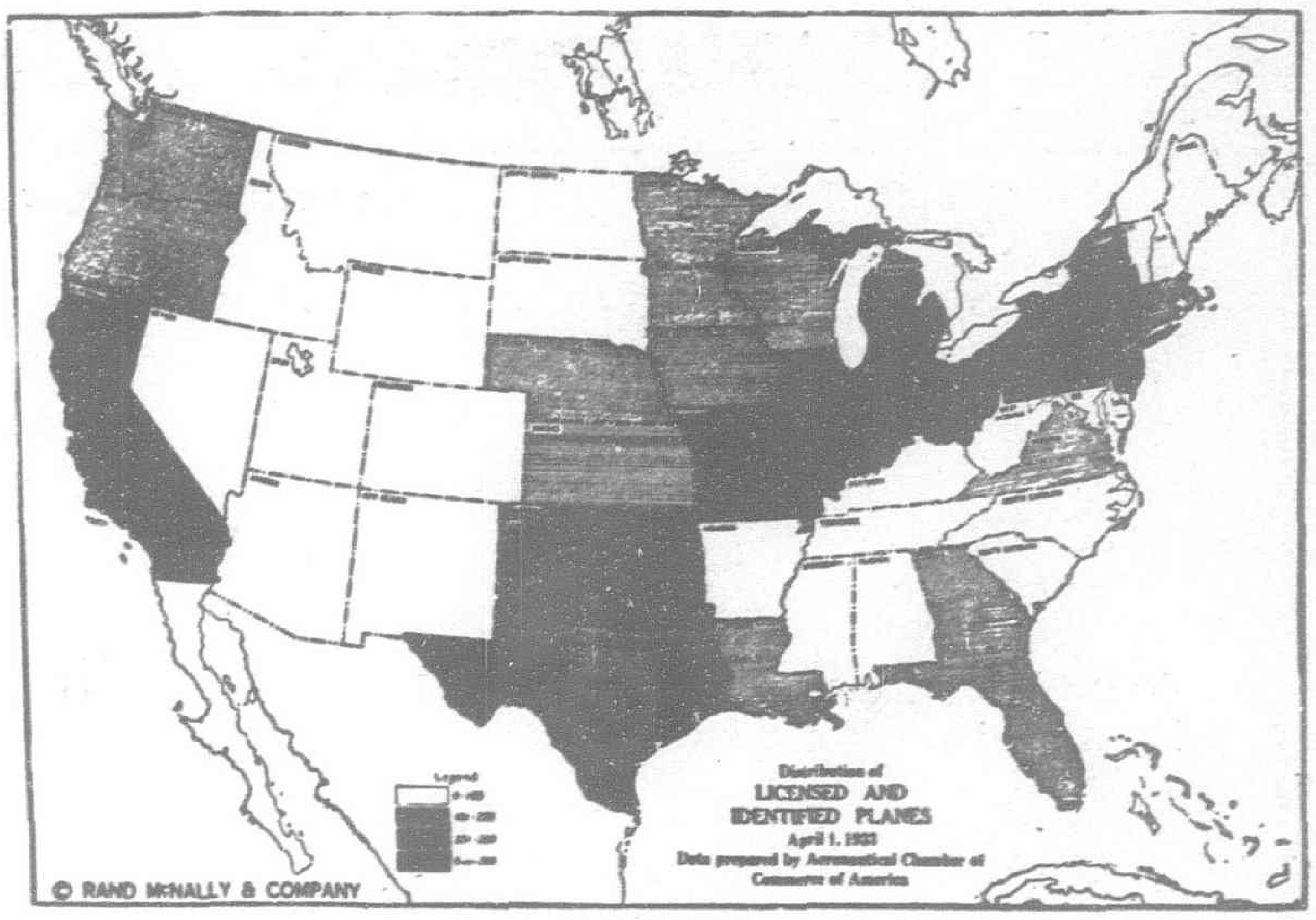

Legend
Distribution of
LICENSED AND IDENTIFIED PLANES
April 1, 1933
Data prepared by Aeronautical Chamber of Commerce of America
© RAND McNALLY & COMPANY

Chart B

With the industrial development of Japan, which depends largely upon the trade and commerce of all its islands and of the bordering countries, air transport demands the attention of all those interested in the progress of this great Empire. The aviation industry is not built upon common industrial foundations; it affects deeply the nation's welfare, and its development is absolutely essential to the defense system of the Empire.

In addition we have made our national defense system stronger through other phases of commercial aviation, a great many business firms own their airplanes, sales and service organizations, private flyers, clubs and companies all this has contributed to the manufacturing, in addition air pilots have increased to

Transport Pilots A I.	..	7,053	Japan Total 391
Commercial Pilots	..	1,158	
Private Pilots ..	..	10,122	
Total	..	18,333	

Chart A.—This map will show in general the distribution of the pilots in the U.S.

We show what the promotion of our civil aviation has contributed towards the use of commercial airplanes other than our Army and Navy airplanes. Chart B shows in general the distribution of licensed airplanes, this has been a great help to our manufacturing industry.

Do not the number of available pilots add to the strength of your national defense system? Also through the development of commercial aviation there are now established in the United States a total of 2,100 Airports.

Your air transport system has shown great strides, but in order to keep pace with other rapidly advancing countries, it would be economical at this time, in addition to offering many advantages to Japan, to extend present operations.

The map will give you a good idea of the many advantages to be gained in trade and commerce, banking, mail and freight, by the use of proper equipment. Flights to Formosa or Shanghai can be made from Tokyo in less than ten hours. The most desirable equipment for such a service is amphibious. With this type of equipment in service there is a landing field along the entire route, and by using this water route the amphibion can safely and reliably be operated under severe weather conditions.

From Tokyo to centers in Manchoukuo, the twin engine airplane will provide rapid and safe transportation. This type of equipment will encourage travel, and faster schedules and will build up mail and cargo services. The government will be provided with an air transport system that in an emergency can be available for mobilization by both arms of the air force, with properly trained pilots experienced in blind flying.

All this will bring about greater developments in radio, radio telephone, radio beacons, weather stations, and with the development of air mail passengers and freight such a system will be self-supporting. In recommending such equipment consideration has been given to the limited landing fields, due to the contour of the islands, but the adoption of such equipment would be economical, and eliminate the need for a large number of emergency landing fields, particularly when such land is expensive and costly to maintain.

It is my belief that the Imperial Aviation Society of Japan and the Department of Communications are worthy of the strong support of all those who are interested in the progress and welfare of Japan in the development of aviation. This development will maintain your manufacturing units, engineering talent, and others trained in the art, as well as contributing much to your military development in times of peace.

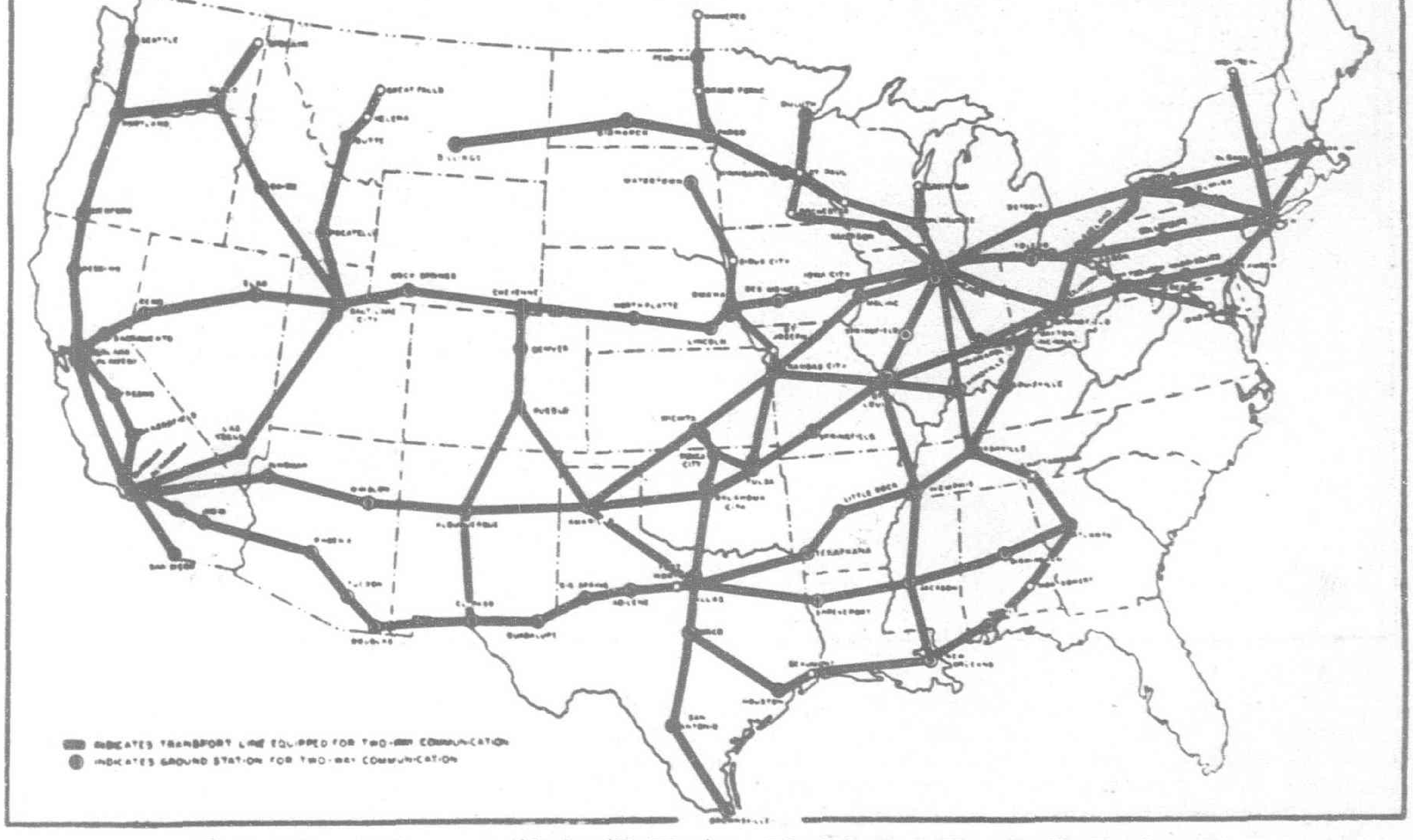

INDICATES TRANSPORT LINE EQUIPPED FOR TWO-WAY COMMUNICATION
INDICATES GROUND STATION FOR TWO-WAY COMMUNICATION

Chart XII.—Airlines provided with Western Electric Two-Way Radio Equipment

Nickel Alloy Steels in the Aeronautical Industry

By JAMES A. RABBITT, Adviser to the Japan Nickel Information Bureau

In the airplane engine there is vital need for safety, and the demand for parts of a high strength and minimum weight have made the problem of materials of prime importance.

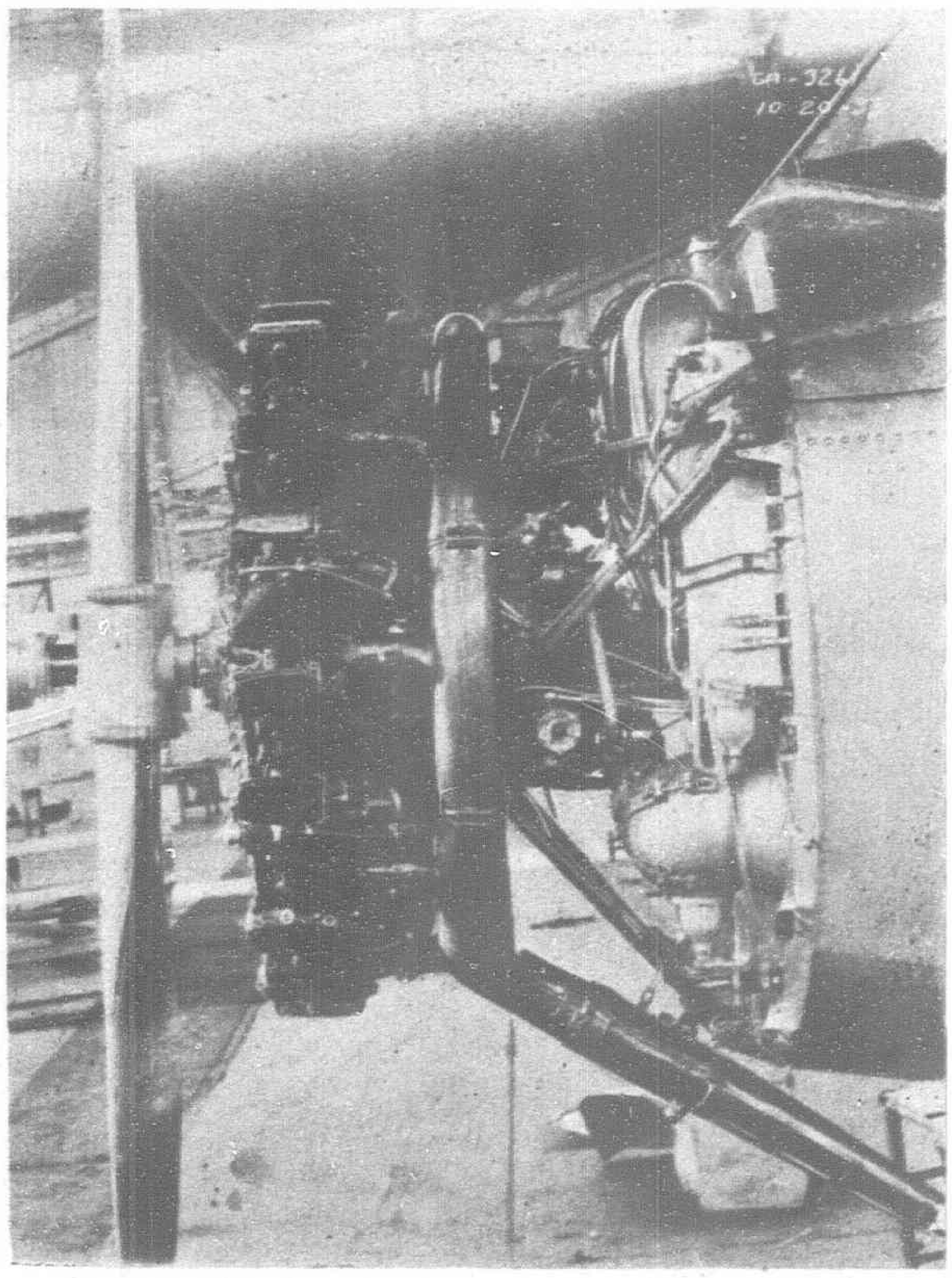
The performance records of the nickel steel parts used in the construction of every well-known aeroplane engine have demonstrated the dependable properties of these steels. The well-known toughness of nickel alloy steels, and the facility with which they can be heat-treated and fabricated, have made them indispensable to engineers designing aeroplane engine parts which are subject to great stress or wear.

The Japan Nickel Information Bureau is prepared to furnish the specification analysis for important parts of a large number of the leading aircraft engines. A number of parts and assemblies from some of the leading aircraft motors are shown in the illustrations accompanying.

The new low wing all metal Boeing plane, one of a fleet of sixty operating on the United Airlines, is powered with two 550 horse-power supercharged motors and cruises at 4.8 km. a minute with ten passengers, luggage and mail aboard.

The Pratt & Whitney "Hornet" engines with which Boeing planes are powered use nickel alloy steels for practically every vital part. The crankshafts and master rods are of modified S.A.E. 3140 nickel-chromium steel, and the link rods of S.A.E. 2340 3.5 per cent nickel steel. S.A.E. 2512, 5 per cent nickel steel, is used for the cam reduction gears and various other nickel alloy steels for the propeller hub, miscellaneous gears, shafts, etc.

Aside from the engines, there are other places where nickel alloy steels contribute to the dependability of Boeing planes, notably in the Oleo strut, landing gear, and bolts, nuts and fittings. The 3.50 per cent nickel steel used for terminals, trunnions, special bolts and forgings is heat treated to as high as 140 kg/mm² tensile strength.



Wright Cyclone Engine and Propeller Assemblage

Super-charger

Heat-resisting nickel-chromium steels are used for the rotors of gas turbines in aero engines in connection with the super-charger, which compensates for the rarefaction encountered at high altitudes. These rotors function at a temperature of 800° to 900° C, and as they are driven by the hot exhaust gases, they must be capable of resisting the scaling and erosive action. The rotors work at a speed of 30,000 revolutions per minute, equivalent to a peripheral speed of about 610 meters per second. Consequently high centrifugal loading is imposed on the material at these high temperatures.

The principal iron parts in the framework of the airplane—body, wings, framework, landing gear, rivets and bolts—and above all the couplings for the slender stays are generally made of semi-hard nickel-chromium steel.

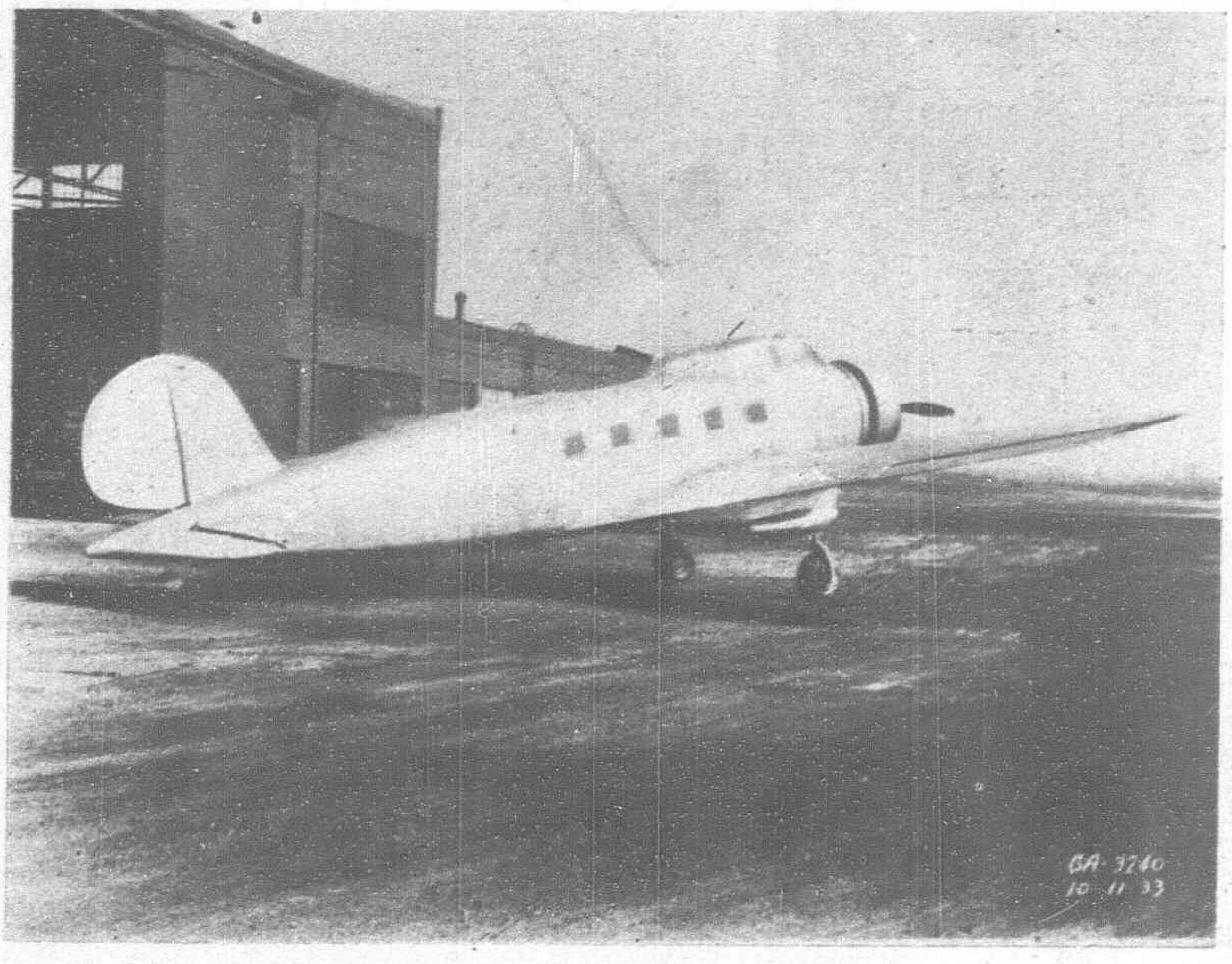
For the stays and the couplings in particular, the utilization of this material has shown marked progress, because nickel-chromium steel allows remarkable improvement in the important elements of construction.

A type of coupling of nickel-chromium steel widely used in France consists of two symmetrical prongs pressed at a high temperature, which, after heat-treatment, gives the following minimum mechanical properties:

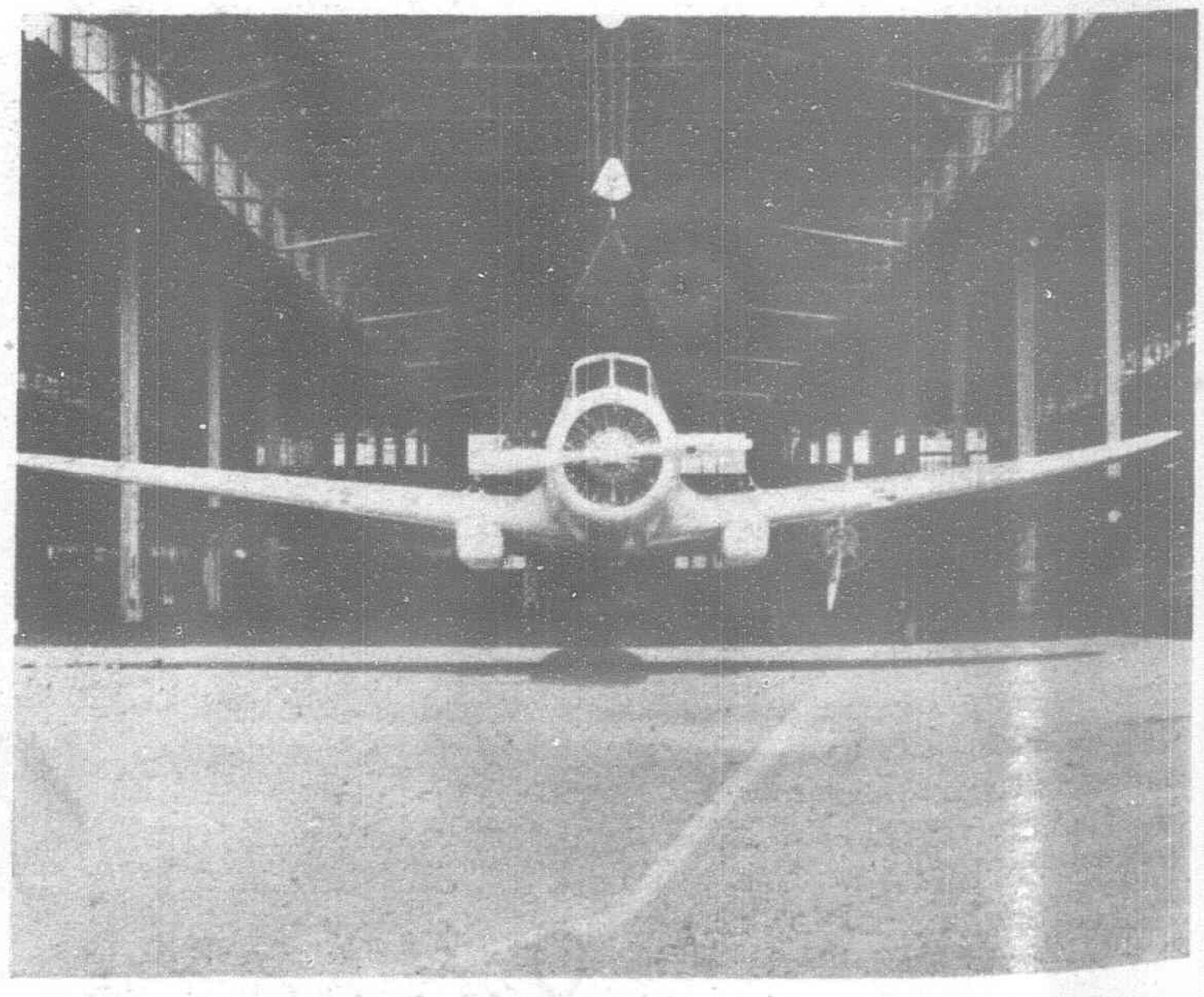
Ultimate Strength.. ..	100 kg/mm²
Elastic Limit	80 kg/mm²
Elongation	10 per cent

These couplings made to specification, give the following minimum resistances to breaking:

1,200	kg for a coupling weighing	7.5 g,
1,750	,, ,, ,, ,,	10 ,,
3,100	,, ,, ,, ,,	19 ,,
4,100	,, ,, ,, ,,	26 ,,
5,000	,, ,, ,, ,,	36 ,,
7,000	,, ,, ,, ,,	55 ,,
8,400	,, ,, ,, ,,	72 ,,
11,500	,, ,, ,, ,,	120 ,,



All Metal Plane, Clark GA-43



Front view of Clark GA-43 showing Retractable Landing Gear

This indicates that the gain in breaking strength of this steel it 50 per cent over the former couplings of carbon steel, quite apart from the greater ease in manufacture.

The simplicity of construction, in the different parts which nickel-chromium air-hardening steel has made possible, even in apparatus of great weight, due to its ease of treatment, and the possibility of producing widely varied sections from a material normalized in advance by the simple operations of cutting, drawing, bending and rolling is well known.

Framework of Airplanes

In the course of the last few years there has been a general utilization of nickel-chronium steels (C 0.35, Mn 0.20, Si 0.12, Ni. 2.5 to 3.0, Cr 0.7 or C 0.30, Mn 0.30, Si 0.25, Ni 3.0 to 3.5, Cr 1 to 1.5) tempered at a temperature of about 400° or 650° C after oil quenching, with the result that the pieces thus heat-treated have greater resistance to wear and shock.

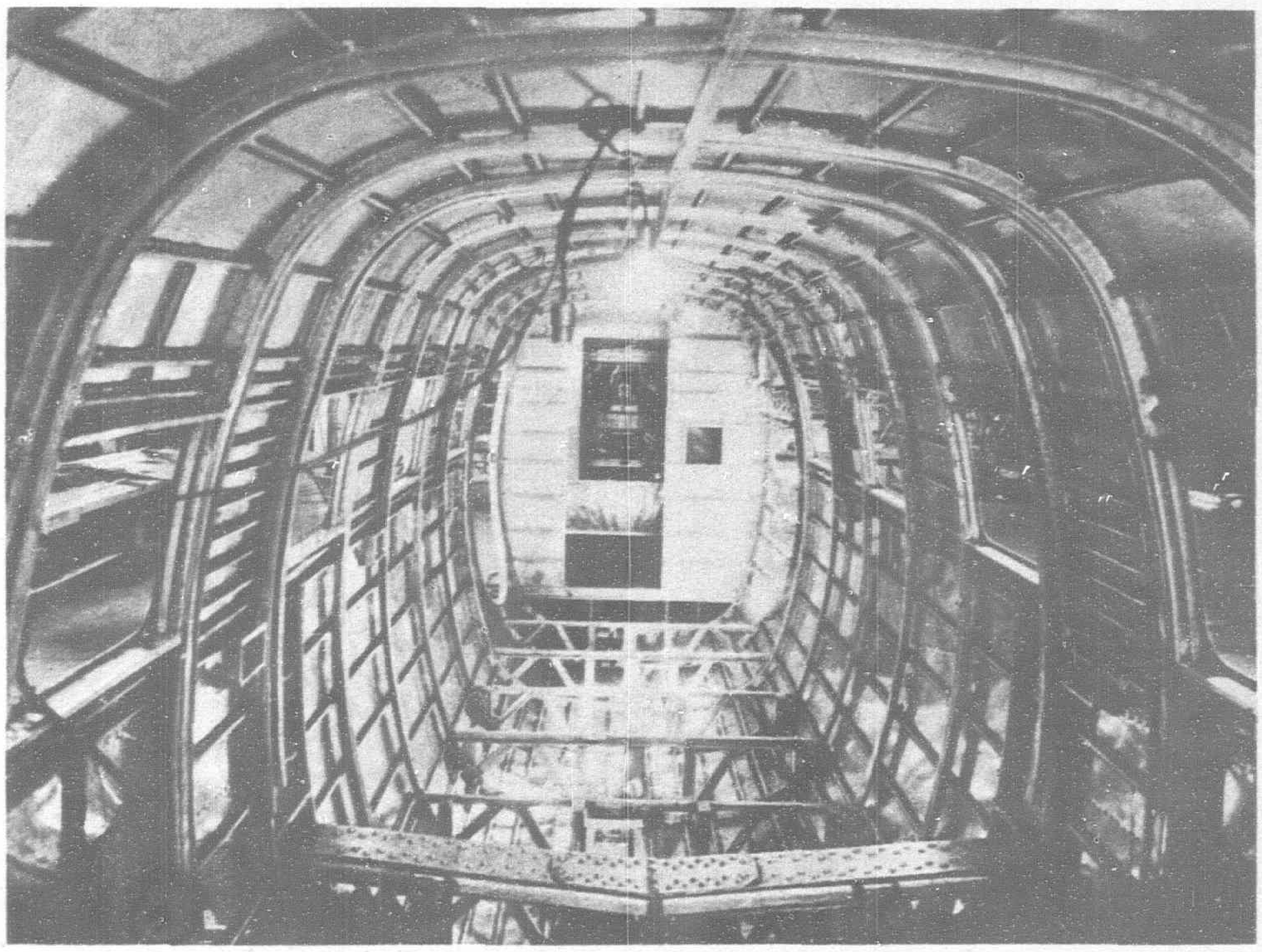
Austenitic Steel for Framework of Airplane

18/8 *steel*, with a maximum tensile strength of about 130 kg/mm^2, is used in aviation. In this form it offers high resistance to corrosion, and is easily machined to the required forms.

The British Air Service Department has officially recognized 18/8 steel by establishing special specifications. Its use in hydroplanes permits complete adaptability to sea water.

Since 1930, technical studies in this field have been carried out, especially in America, France and England, to solve the delicate problems arising from the fabrication of thin and uniform rolled bands (a band of 25/100 mm. thickness is generally used). Thus in America the "Budd" hydroplane is constructed, entirely of corrosion resisting steel, and the parts are electrically welded.

The most widely used process for welding the parts is that of spot welding which may be compared to the process in forge welding 18/8 steel has the advantage of undergoing practically no change in structure or in mechanical properties during the operation, which is very rapid.



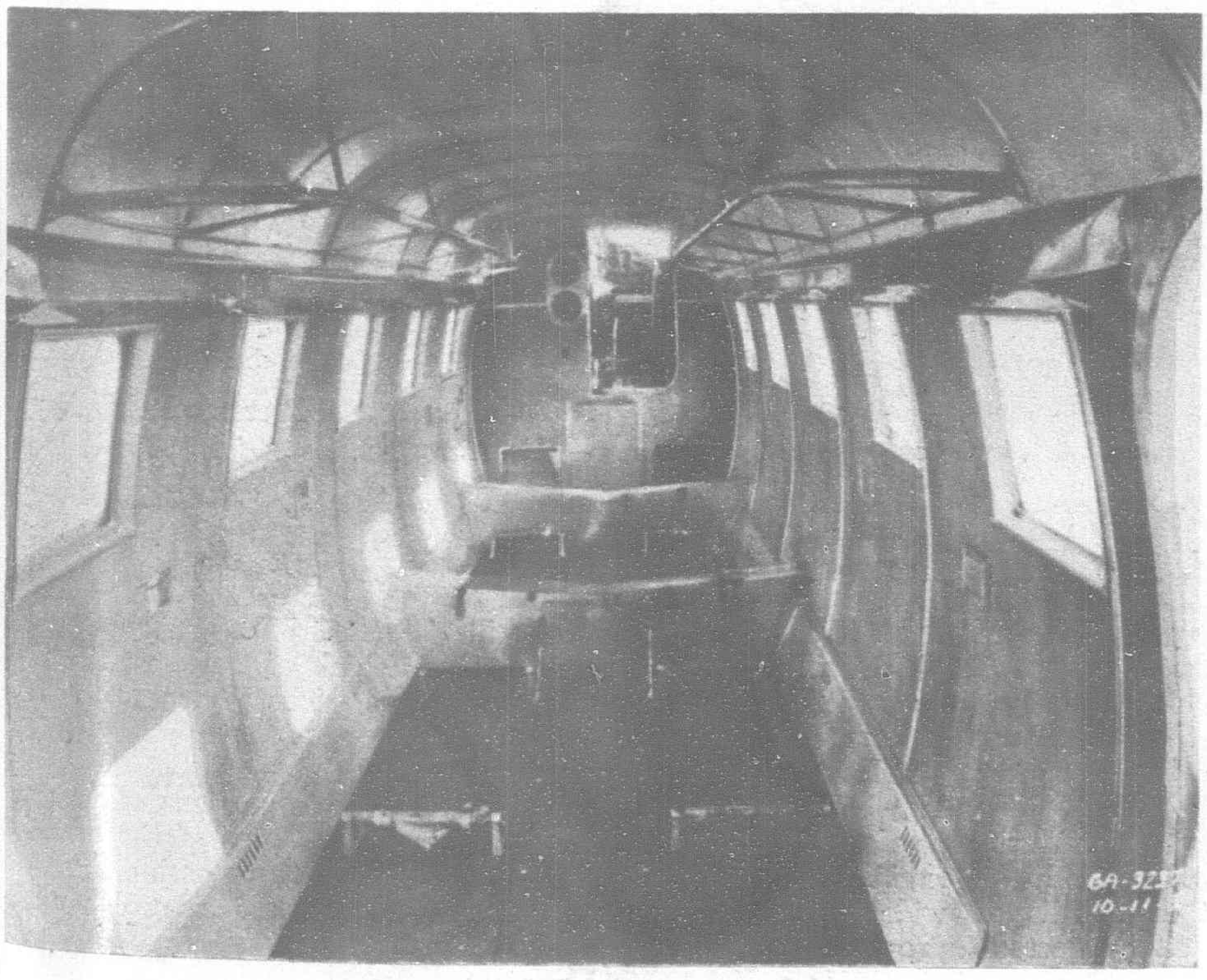
Interior construction of Fuselage made of Alloy Steel

One entirely new method of constructing the framework of an airplane has been made possible by the use of these nickel-chromium air-hardening steels. Formerly the fuselage was constructed of rectangular frames in the shape of a truss.

Special steels were used in the construction of this beam only as stretched stay wires, and only the obtaining of maximum lightness and rigidity was considered. All other equipment as well as passenger accommodations were sacrificed to the rectangular trussed fuselage.

The use of special steels has made possible the replacement of the truss-frame by the tubular fuselage obtained by welding and has made possible the separate construction of the inside equipment of the fuselage.

The height and the width of these tubular beams are one-third to one-quarter less than the truss-frame fuselages, while keeping the same, if not superior, torsion and resistance. The use of special steels gives a new aspect to the fuselage of an airplane, which can now be considered as a chassis on which is adapted an independent carriage body.



Interior of Passenger Compartment

The use of steels of high strength is of advantage in the construction of wings on a single longeron, cabin masts and landing gears, the size of which can be reduced and still present less forward resistance under the same load than if they were constructed of a light aluminum alloy.

The thinness of the parts, varying from 20/10 to 4/10 mm. and even at times going to 15/100 mm., has necessitated the determination of the appropriate forms, outlines, curves and pressing to avoid local collapse, and to assure in the parts the correct transmission of stress and greater efficiency plus economy in weight with increased safety.

A Transport Plane in Japan

The Clark GA-43 Airplane brought to Japan by Mr. Victor Bertrandias for the Nakajima Aircraft Works is a striking example of high speed aircraft constructed with modern alloys.

The illustrations show the simplicity of design made possible by the all metal construction resulting in low air resistance And also illustrate the landing gear retracted, as in flight, to obtain greater freedom from air resistance.

Another picture shows the alloy steel interior construction of the fuselage. The fuselage is divided into five sections—the pilot's cab, passenger cabin, lavatory, front and rear baggage compartments, and tail section. Each one of these sections is separated from the other by complete alloy bulkheads with doors for access. Fig 76 shows the interior of the passenger compartment with the steel frame covered. The method of attaching the wing structure to the fuselage by alloy steel connecting plates is also shown.

An accompanying illustration shows the 700 h.p. 1,950 r.p.m. Wright Cyclone engine and propeller assemblage. The propeller is made of alloy steel, the exhaust manifold is made of 18/8 stainless steel, and in the engine the following parts are made of nickel alloy steel.

Parts of Engine Made of Nickel Alloy Steel

Bolts—Miscellaneous.

Bushings—Miscellaneous.

Cage—Front Cover B.B., Crankshaft Extension B.B., Impeller Drive Gear B.B.

Cam—Inlet and Exhaust.

Capscrew—Crank Cheek.

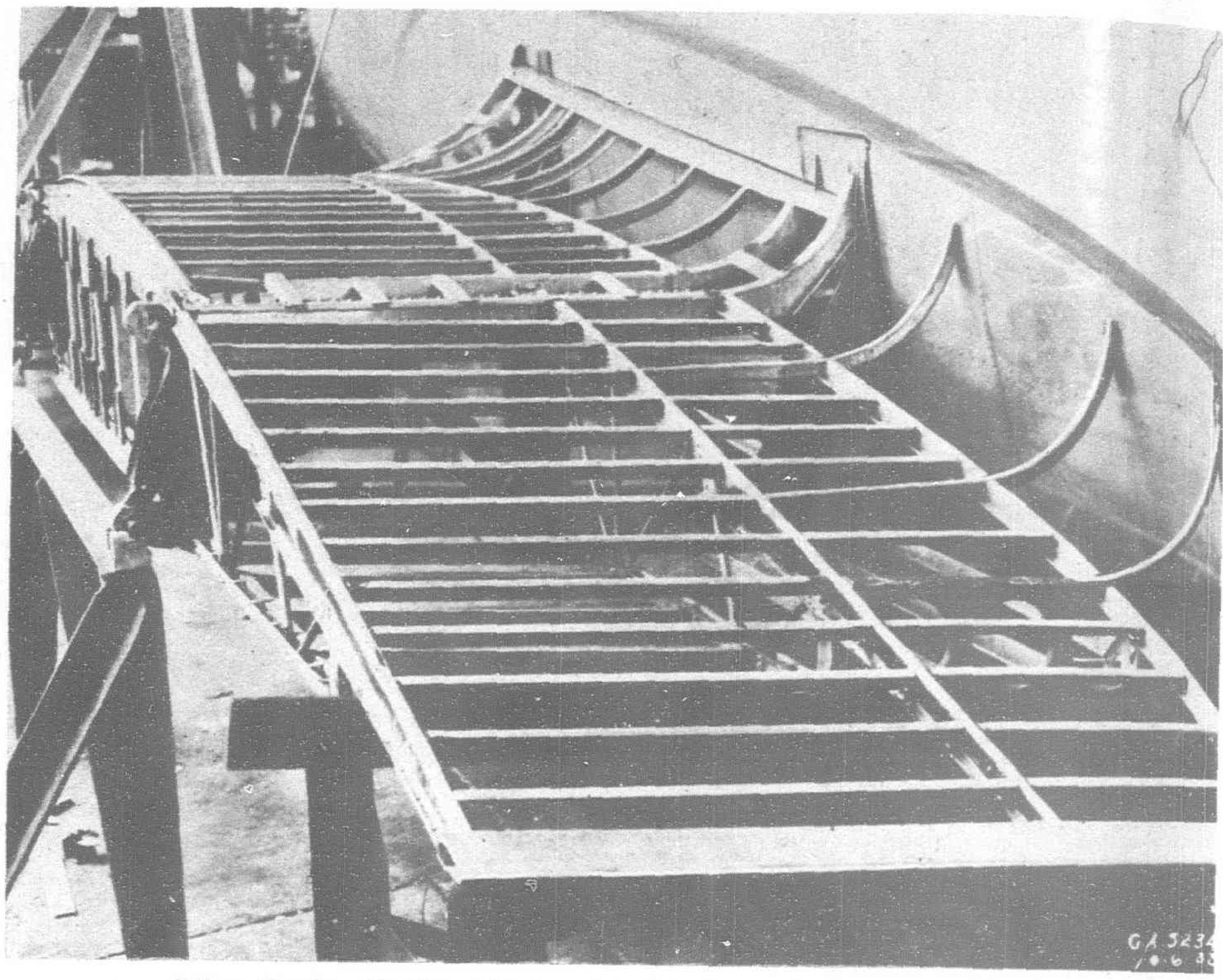
Crankshaft—Front Bearing Adapter, Front End, Rear End.

Connection—Oil Thermometer.

Dog—Cam Driving Front, Driving Rear.

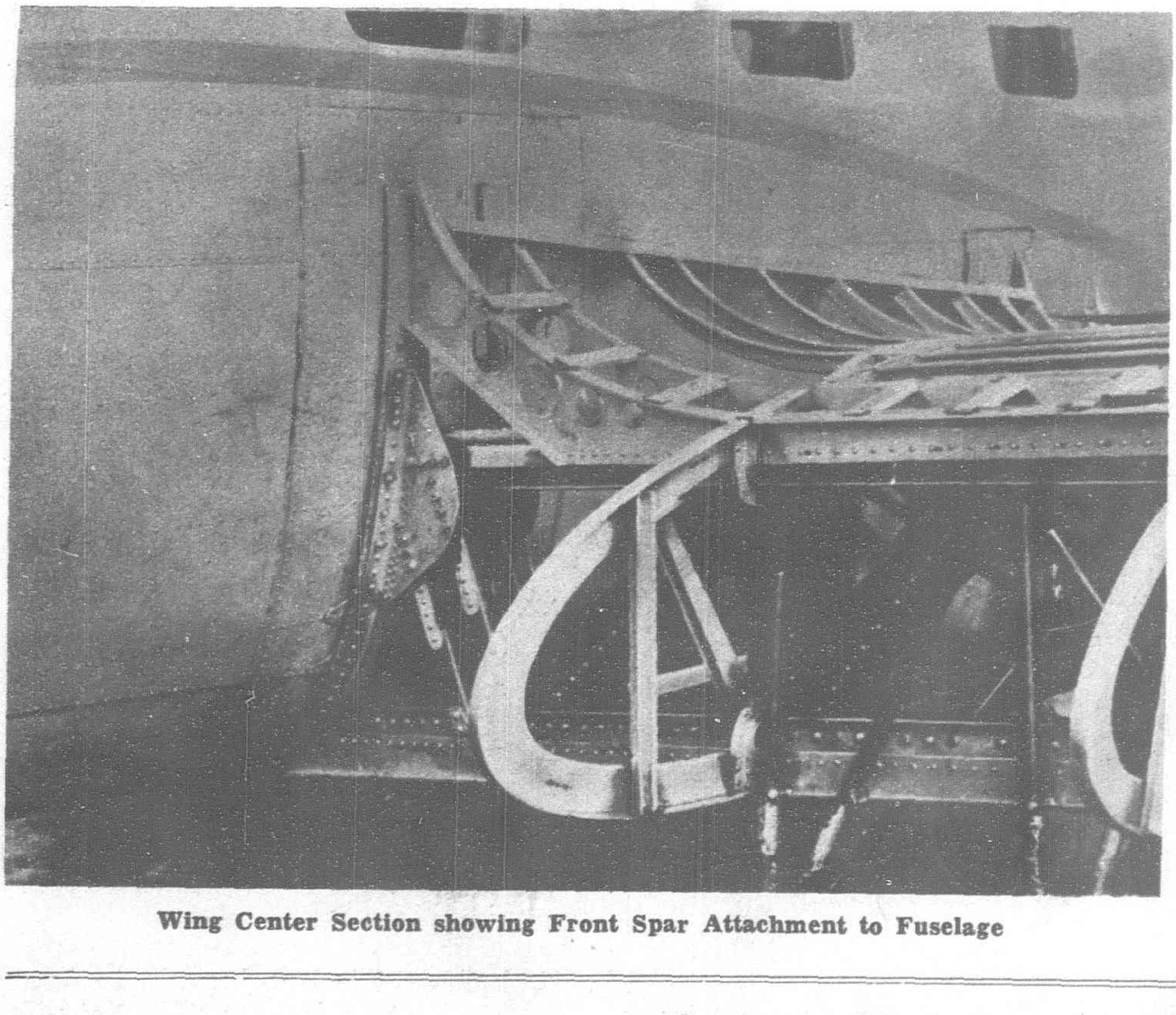
Extension—Crankshaft.

Flange—Propeller Hub.



Wing Center Section Uncovered showing Attachment to Fuselage

Gears—Cam Drive, Fuel Pump, Generator, Generator Drive, Gun Control and Fuel Pump Drive, Gun Control and Oil Pump Drive, Impeller Drive Shaft, Impeller and Generator Drive, Impeller Inter. Ratio 8.74 to 1, Magneto, Magneto Drive, Oil Pump Drive, Pump Drive 11 mm. Face, Pump Idler 13 mm. Face, Pump 10 mm. Face, Pump 11 mm. Face, Pump Drive 10 mm. Face, Tachometer Drive.



Wing Center Section showing Front Spar Attachment to Fuselage

Guide—Exhaust Valve, Valve Tappet.

Hub—Propeller, Rocker Roller.

Lock—Valve Spring Washer, Exhaust and Intake.

Nuts—Miscellaneous.

Pin—6 mm. dia. × 15 mm. Head, Knuckle, Piston, Valve Tapped Roller.

Pinion—Cam Drive.

Propeller Hub Centering Ring (Front).

Retainer—Crankpin Plug, Front Cover B.B., Rocker Hub Bearing.

Ring—Propeller Hub Snap.

Rivet—Miscellaneous.

Rocker—Intake Valve, Exhaust Valve, Roller, Roller Hub.

Rod—Articulated, Master Connecting.

Roller—Valve Tappet.

Screw—Miscellaneous.

Shaft—Cam Drive Gear, Impeller and Gen. Drive, Oil Pump Drive Gear, Oil Pump Idler.

Socket—Valve Tappet Ball.

Spacer—Rocker Hub Bearing.

Stud—Miscellaneous.

Thrust Plate—Rocker Bearing.

Valves—Exhaust, Oil Pressure Relief, Tappet.

Washer—Miscellaneous.

Osaka to Have Largest Bridge

Osaka will attain the distinction of having Japan's largest suspension bridge, across the Shin Yodogawa, in the summer of 1936. The municipal civil engineering bureau, which recently completed plans and specifications, will embark on the real stage of construction work next February, and 30 months later the bridge will be ready for traffic.

The bridge is to be built about halfway between the Juso Ohashi and the Nagara Ohashi. It will be nearly half a mile long and 29 meters wide. The whole structure will rest on two huge piers, each consisting of four concrete caissons, which will be erected 57.5 meters from each bank.

Above these two piers will rise steel pillars, from the top of which will droop four massive bars, which will support the bridge floor with the aid of 48 auxiliary bars. The central span will be 115 meters long.

Each pier is designed to withstand the weight of 15,000 tons. The bridge floor will be divided into three sections. The center portion will be used by the double tracked line of the municipal rapid transit system, and the two outer portions, each eight meters wide, will be used for vehicular traffic, while sidewalks will be provided at the edges.

It is a Y.3,500,000 project.

The Port of Singapore*

By G. W. A. TRIMMER, M.Inst.C.E., M.I.Mech.E., M.Inst.T., Chairman and General Manager, Harbor Boards Straits Settlements

THE Island of Singapore is 88 miles North of the Equator and contains an area of 217 square miles; the population numbers some 567,000 persons and is probably the most cosmopolitan one in the world, about three-quarters of the people are, however, Chinese, and an eighth Malays, while the Europeans total about 8,200.

There is a continuous stream of passengers of various nationalities who land and spend a day or so in Singapore when passing through on ocean voyages or making coastal connection. The deck passengers are Chinese, Indians (including Tamils and Malabaris), Singalese, and Javanese estate laborers, also Malay and Javanese pilgrims *en route* to Mecca.

Many languages are heard, all manner of habits are seen, and numerous varieties of food are consumed; truly, a more varied moving population it would be hard to find.

The approach to the Harbor of Singapore is one of the most beautiful in the world, and probably one that Rio de Janeiro, Sydney, and, perhaps, Hongkong, do not in any way surpass in the panorama of views that meets the eye when entering the port of Singapore.

The harbor is practically land-locked by islands, and these afford such protection that until the reconstruction of the wharves was put in hand some twenty-two years ago, the berthing accommodation consisted only of wooden wharves on wooden piles. The difference between the rise and fall of ordinary spring tides is 9-ft.

A glance at the map confirms Singapore's designation as "The Crossroads of the East."

The Charter or Port Policy may be said to have been given or laid down by Sir Stamford Raffles at the head of his report to the Government of India, when he wrote in 1819:—

> "I have declared that the Port of Singapore is a free Port and the trade thereof open to ships and vessels of every nation free of duties, equally and alike to all."

In 1820 Col. Farquhar reported:—

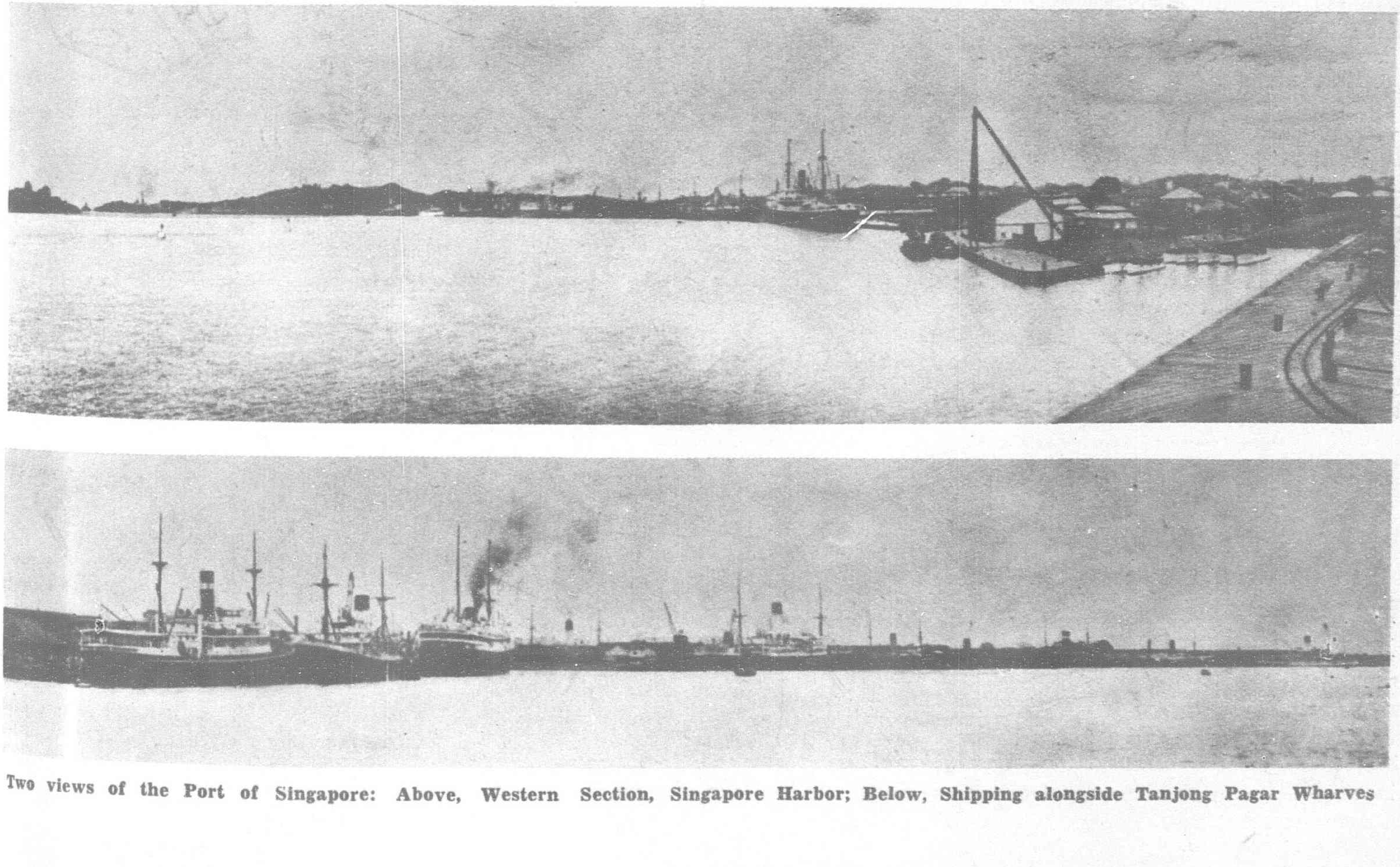
> "One of the principal Chinese merchants here told me, in the course of conversation, that he would be very glad to give five hundred thousand dollars for the revenues of Singapore five years hence.
>
> "Nothing can possibly exclude the rising trade and general prosperity of the infant Colony. Merchants of all descriptions are collected here so fast that nothing is heard in the shape of complaint but the want of more ground to build on."

The Port Limits of Singapore cover an area of 23,168 acres, or 36¼ square miles, and consist of an Inner Harbor, Outer Harbor and Western Anchorage.

A wonderful variety of vessels is to be seen in the Harbor; in addition to the large ocean-going passenger and cargo steamers there may be seen at all times some hundred or so local coasting steamers, several of about 800 tons burden but mostly about 100 tons only, the adjacent Dutch Islands with their many inlets and settlements requiring a large service of small vessels for carrying food supplies and collecting produce. There is also a large number of Chinese junks, and native six-oared fishing boats, the rowers standing facing the direction in which the boat is proceeding.

Although the majority of ocean-going steamers are berthed at the wharves of the Singapore Harbor Board, many vessels discharge and load in the Inner and Outer Harbor, necessitating a continual flow of lighters to and from the warehouses on the banks of Singapore's short and narrow river and the Telok Ayer Basin.

The Inner Harbor is protected from the North East Monsoon by a mole of granite rubble about a mile long. The capacity of the Inner Harbor allows forty coasting vessels, varying in length



Two views of the Port of Singapore: Above, Western Section, Singapore Harbor; Below, Shipping alongside Tanjong Pagar Wharves

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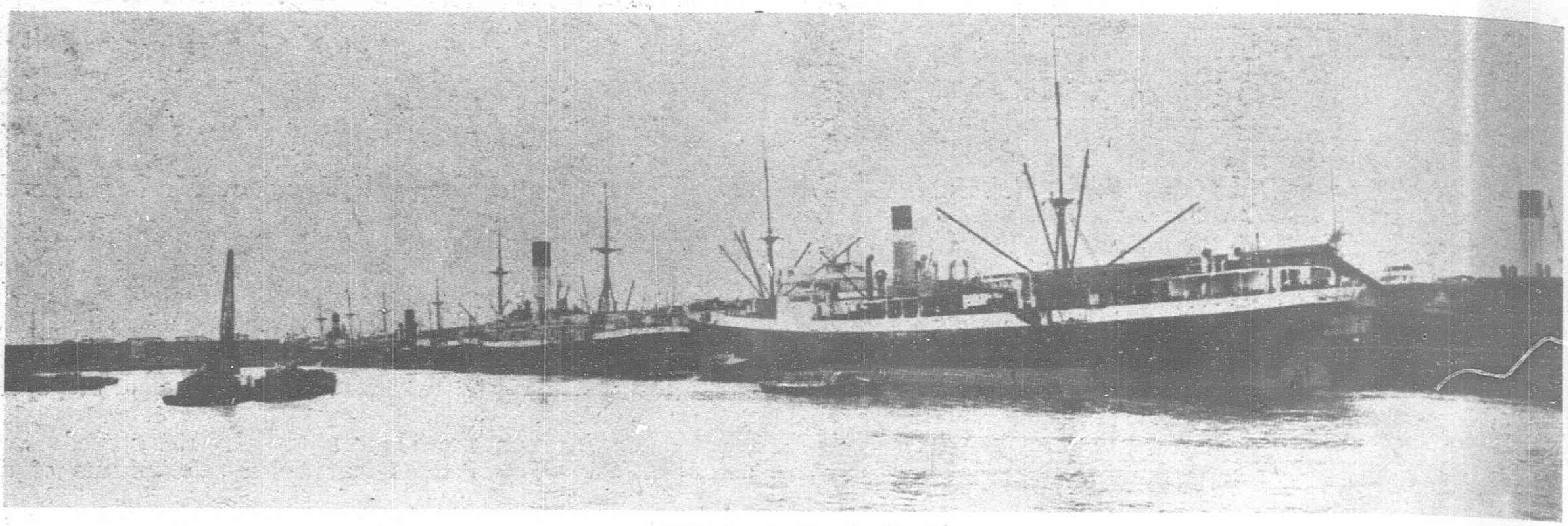
The Dock and Harbor Authority.



Shipping in Empire Dock

from 150-ft. to 315-ft., to lie at single anchor within the shelter of this breakwater.

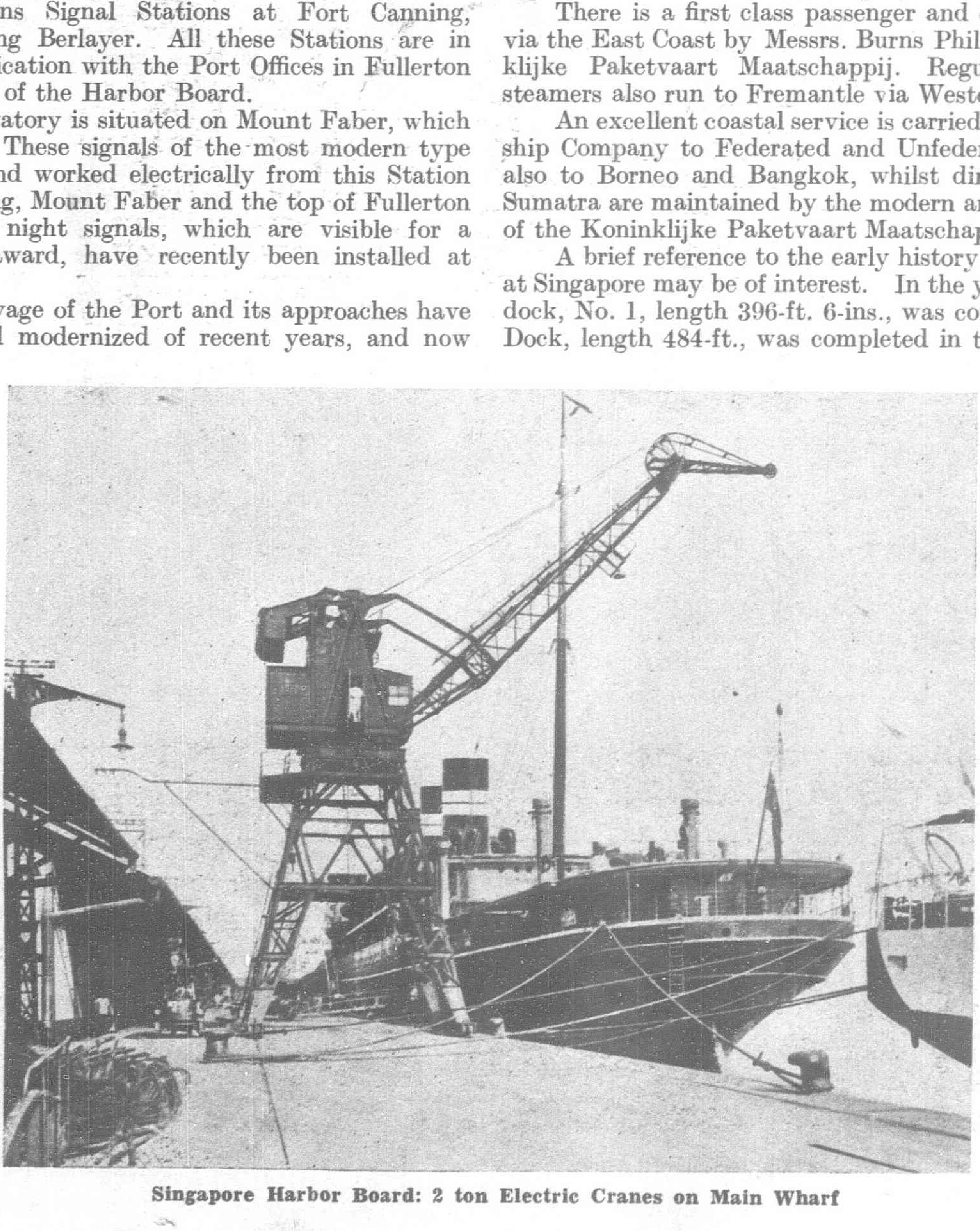
Situated on islands at the extreme westward limits of the Port are two oiling stations which comprise extensive storage and bunkering facilities. That on Pulau Bukom is owned by the Asiatic Petroleum Co. (S.S.), Ltd., and that on Pulau Sebarok by the Standard Oil Co. of New York.

On West St. John's Island at the Southern approaches to the Port is the Quarantine Station site; this is reputed to be one of the most up-to-date in the world, and is recognized as second only in size to Ellis Island, New York.

Government maintains Signal Stations at Fort Canning, Mount Faber and Tanjong Berlayer. All these Stations are in direct telephonic communication with the Port Offices in Fullerton Building and the wharves of the Harbor Board.

A Government observatory is situated on Mount Faber, which directs the time signals. These signals of the most modern type for the use of shipping and worked electrically from this Station are located at Fort Canning, Mount Faber and the top of Fullerton Building. Electrically-lit night signals, which are visible for a considerable distance seaward, have recently been installed at Mount Faber.

The lighting and buoyage of the Port and its approaches have been much improved and modernized of recent years, and now compare favorably in that respect with any port in the world.



Singapore Harbor Board: 2 ton Electric Cranes on Main Wharf

Merchant ships representing a tonnage of 10,254,150 tons, entered the Port of Singapore in the year 1923. During the year ended 1931 merchnat ships representing a tonnage of 14,631,765 tons, entered the Port.

Regular callers at Singapore from the United Kingdom and the Continent are Alfred Holt's Blue Funnel Line, the P. & O., Glen, Ben and City Lines, and the Messageries Maritimes, Nippon Yusen Kaisha, Nederland Royal Mail, Rotterdam Lloyd, East Asiatic, Lloyd Triestino and Osaka Shosen Kaisha steamers.

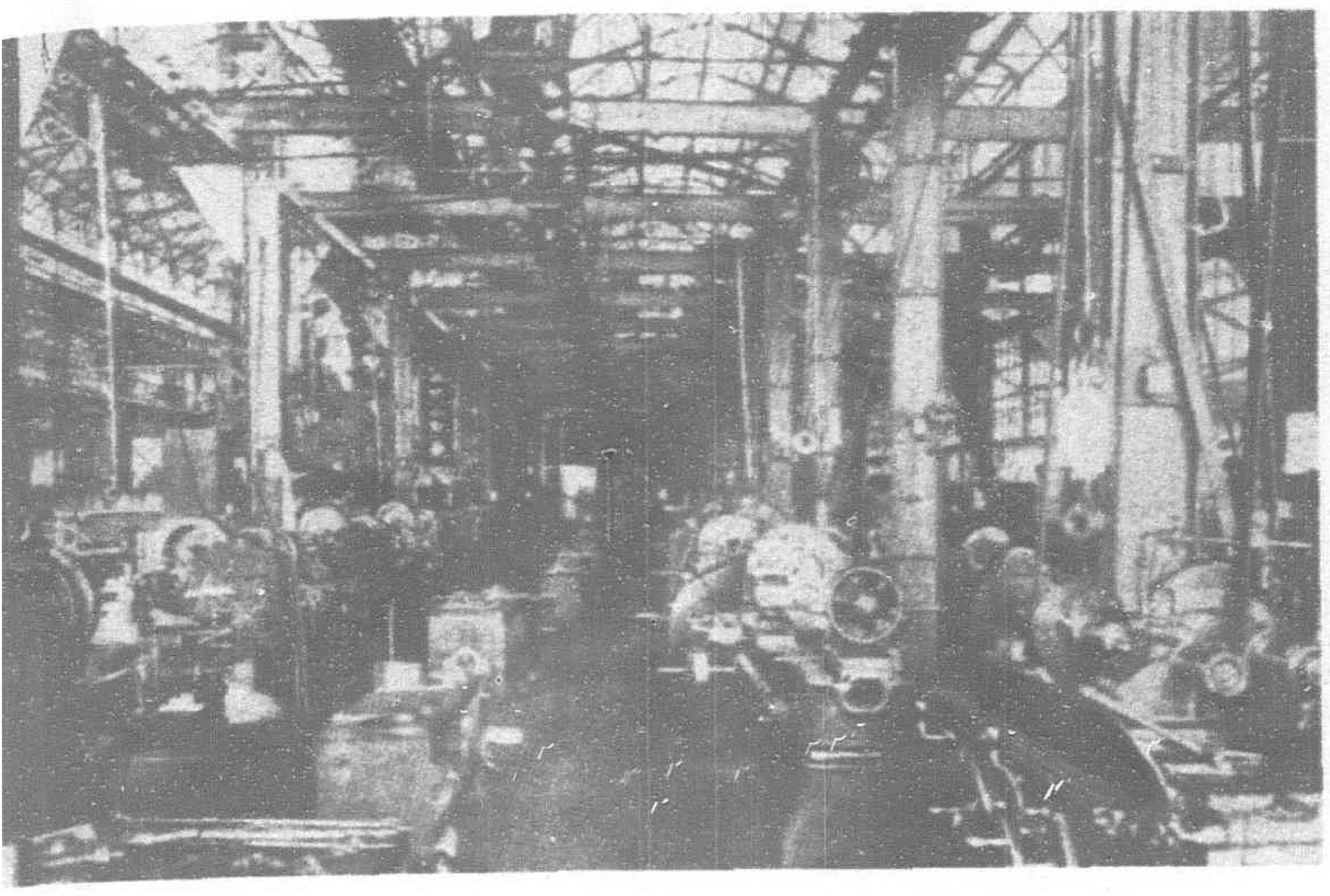
The British India Steam Navigation Company maintain a regular service between Calcutta and Japan. Their passenger steamers, of a high order, also run regularly to Rangoon and Madras, mail train connection with Bombay being made from the latter port. Messrs. Jardine Matheson, and many other companies, operate to and from China ports.

The Dollar Steamship Lines, with steamers arriving at Singapore every two weeks, maintain a passenger and cargo service to the United States via Ceylon, India and Mediterranean Ports. There are cargo services to New York via the Mediterranean by vessels of the Holt and Ellerman Lines, Prince Line, Dodwell Castle Line and Kerr Steamship Co.

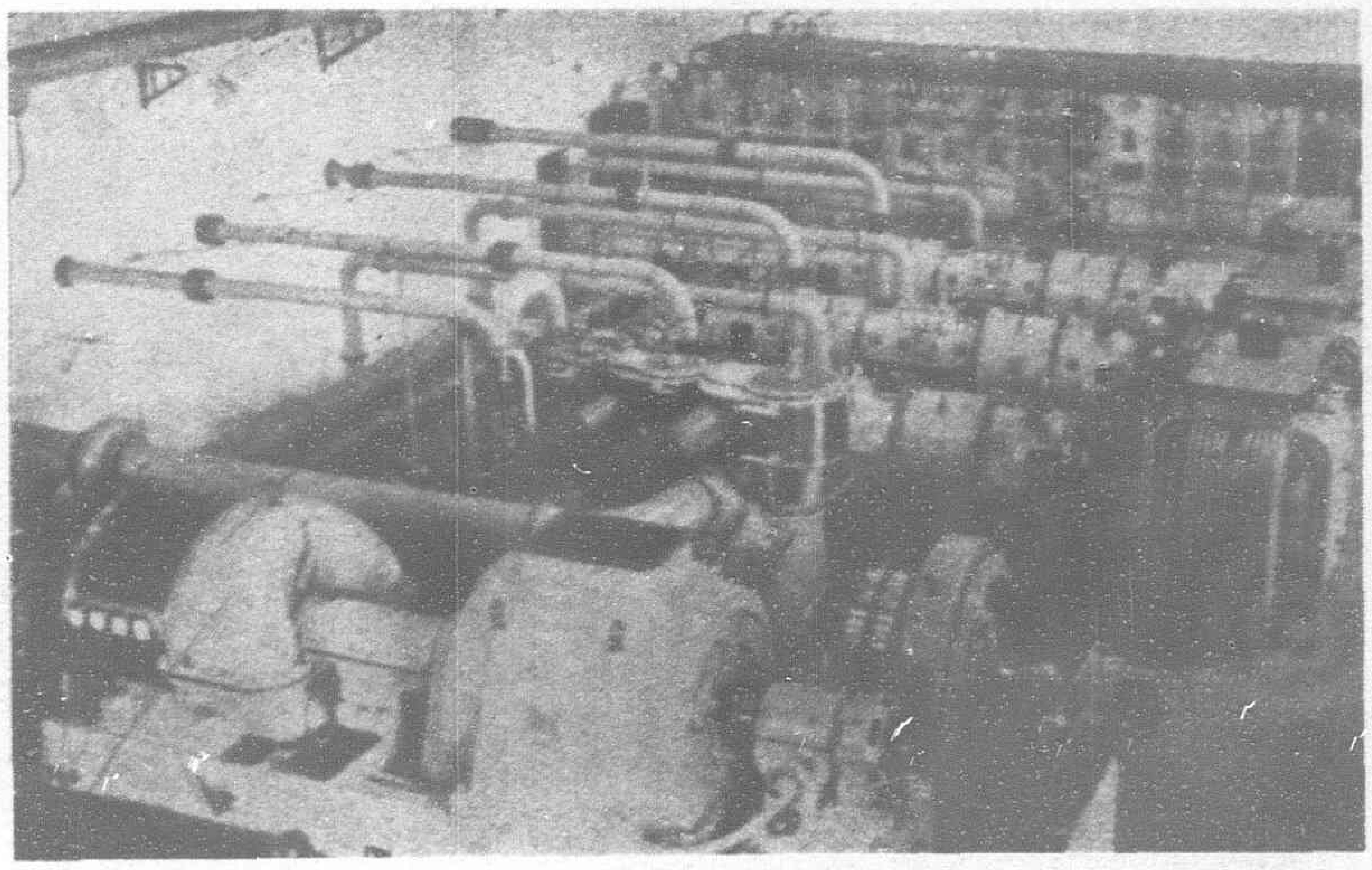
There is a first class passenger and cargo service to Australia via the East Coast by Messrs. Burns Philp Co., and Messrs. Koninklijke Paketvaart Maatschappij. Regular passenger and cargo steamers also run to Fremantle via Western Australia ports.

An excellent coastal service is carried out by the Straits Steamship Company to Federated and Unfederated Malay States ports, also to Borneo and Bangkok, whilst direct services to Java and Sumatra are maintained by the modern and well-equipped steamers of the Koninklijke Paketvaart Maatschappij.

A brief reference to the early history of the Dock undertakings at Singapore may be of interest. In the year 1859, the first graving dock, No. 1, length 396-ft. 6-ins., was completed, and the Victoria Dock, length 484-ft., was completed in the year 1868. The Dock and Wharf business was for over forty years conducted by two Companies (the Tanjong Pagar Dock Co., and the New Harbor Dock Co.). The former Company suffered an anxious period in its early years, and at brief intervals later, but generally both Companies flourished and steadily developed while paying dividends to their shareholders, averaging nearly 12 per cent per annum. These Companies formed a joint-purse agreement in the year 1881, and amalgamated in the year 1899, when by absorption of Reserves the joint capital was doubled to $3,700,000 fully paid. The Company's undertaking was, however, by direction of the Colonial Office, expropriated by the Straits Settlements

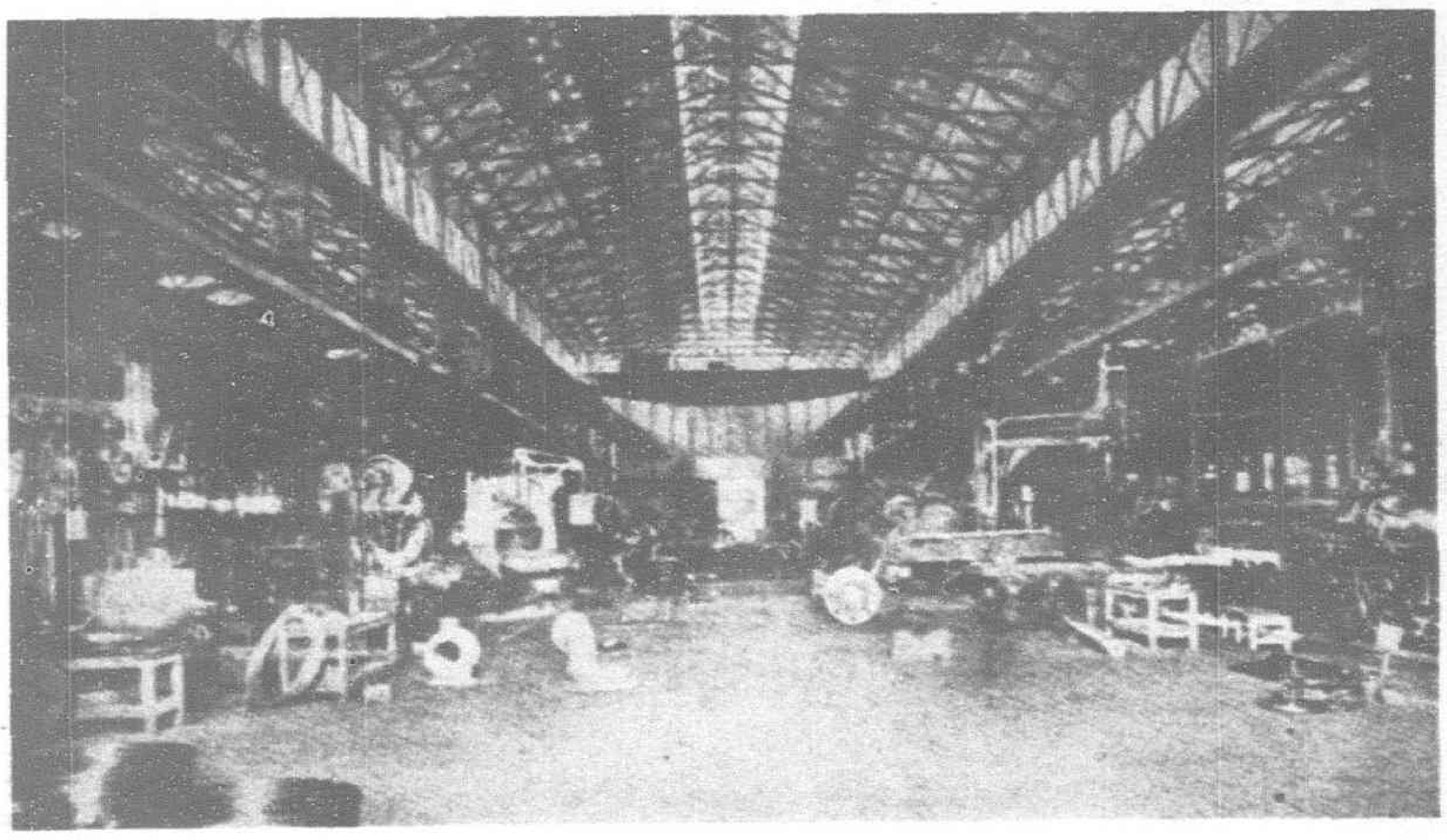


Singapore Harbor Board: Eastern Bay of the Machine Shop



Electric Power Station showing Brush, Ljungstrom and Parsons Turbines

Government in the year 1905 with a view to greatly developing the docks and wharves, and for Government control of the Port of Singapore in Imperial interests. The Government offered $240 per share (the market value immediately prior to expropriation, being about $230 per share) to the Company, which was declined, and eventually had to pay some $760 per share in terms of an award by Sir Michael Hicks-Beach, P.C., M.P., the Umpire (later The Right Honorable Michael Edward Viscount St. Aldwyn), as the result of protracted arbitration proceedings conducted in both London and Singapore, and extending over a period of twelve months, and constituting a *cause célèbre* in arbitration proceedings between a Dock Company and Government.



Central Bay of the Machine Shop

The Government action, however, in acquiring in 1905 this hitherto privately-owned undertaking and constituting a Harbor Board for the purpose of administering it, has been amply justified, both financially and otherwise. Development on bold lines, the provision of additional docks and the improvement, rebuilding and extension of the wharves, have made the Port of Singapore second to none in the East.

A very interesting treatise on the Dock undertakings in Singapore is to be found in "One Hundred Years of Singapore," which is an historical account, in two volumes, of the capital city of the Straits Settlement from its foundation by Sir Stamford Raffles on February 6, 1819 to February 6, 1919. The work was published in 1921 by John Murray, London.

The pilotage service is under the direction of a Pilot Board appointed by the Governor with the Master Attendant as President.

Singapore is a free port, there being no port, harbor, dock, town or light dues. Customs duties are levied on opium, alcoholic liquors, tobacco and petroleum only.

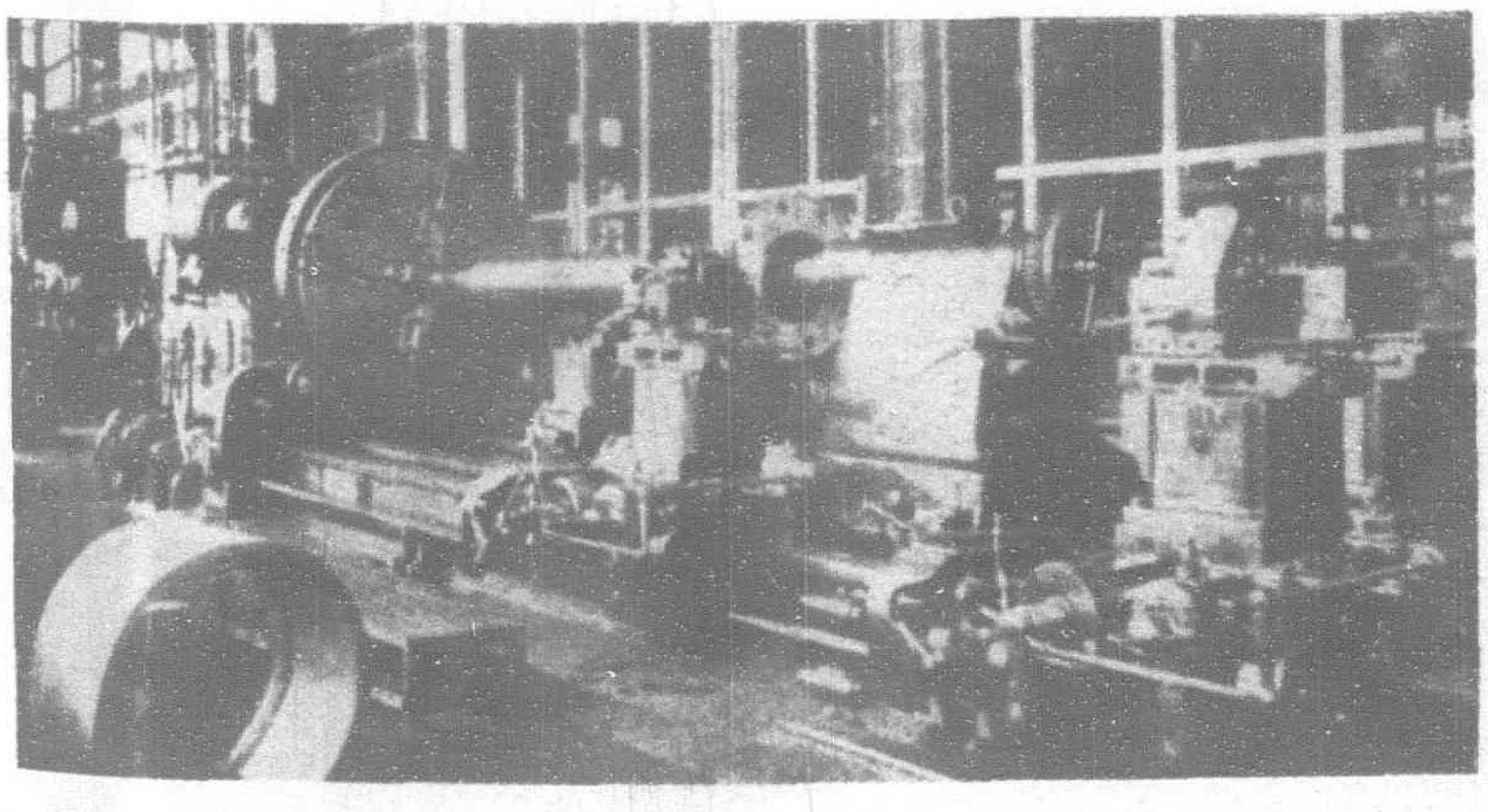
The Port, Shipping and Clearance Offices are all situated on the first floor of Fullerton Building, overlooking the Inner Harbor.

A large and well-equipped modern Sailors' Institute, controlled by Government, is situated in Anson Road in the approach to the Harbor Board and Docks. Officers and seamen of all nationalities are welcome. Lawn tennis, billiards, whist drives, concerts, dances and cinema entertainments are arranged at frequent intervals, free of charge. The Mission to Seamen, by permission of the Committee of the Institute, is also housed in this building.

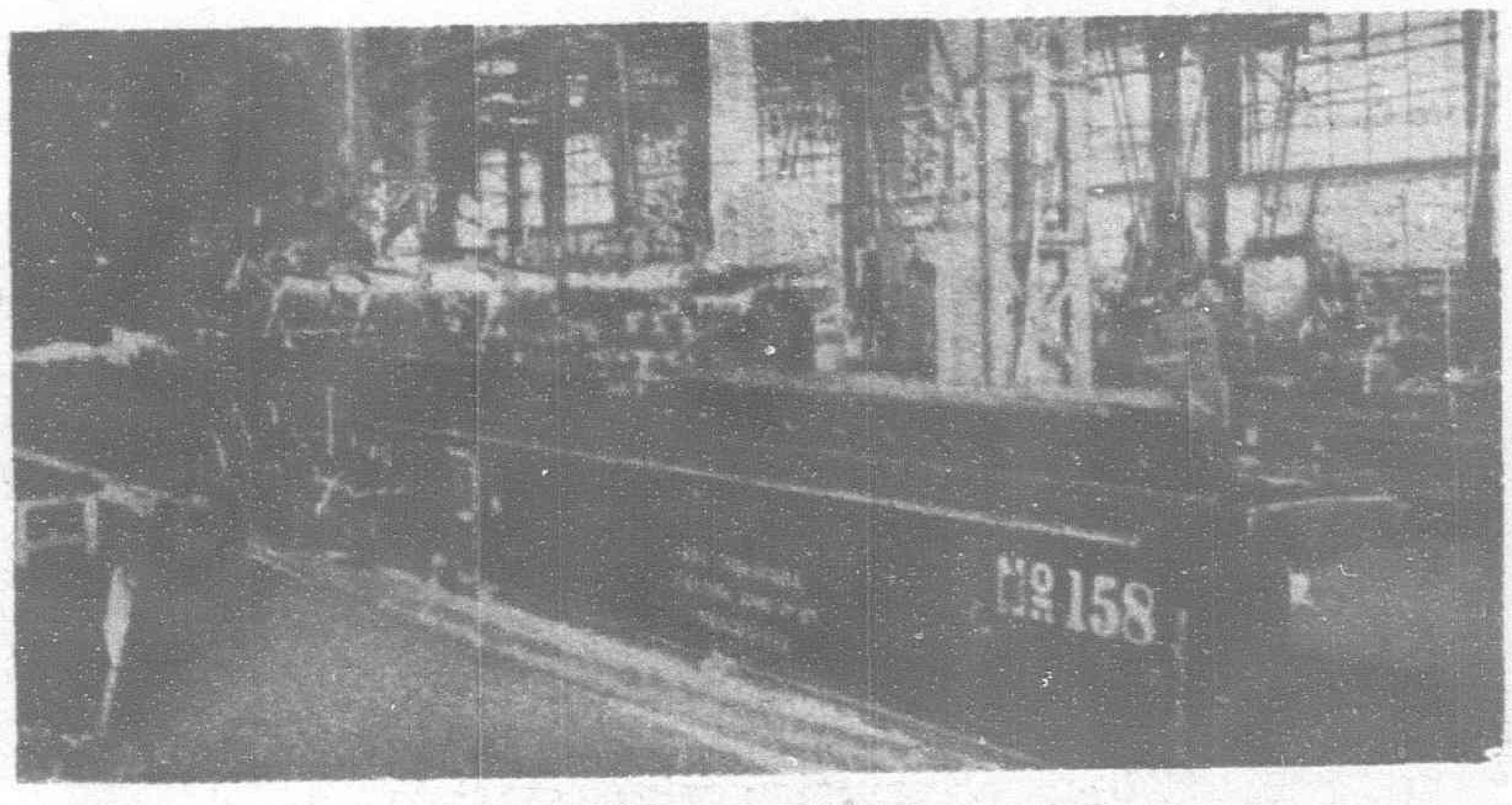
The Singapore Harbor Board

The Singapore Harbor Board controls all the public wharves and dry docks in Singapore, the Estate comprising over 690 acres of land, much of which is available for future development of the docks and wharves and their adjuncts. The Board is constituted under an enactment by the Governor of the Straits Settlements, entitled Ordinance No. 130 (Ports). The Board consists of a chairman, deputy-chairman and three to seven other members, all appointed by the Governor of the Colony. By-laws and rates and charges are made by the Board, subject to the approval of the Governor-in-Council.

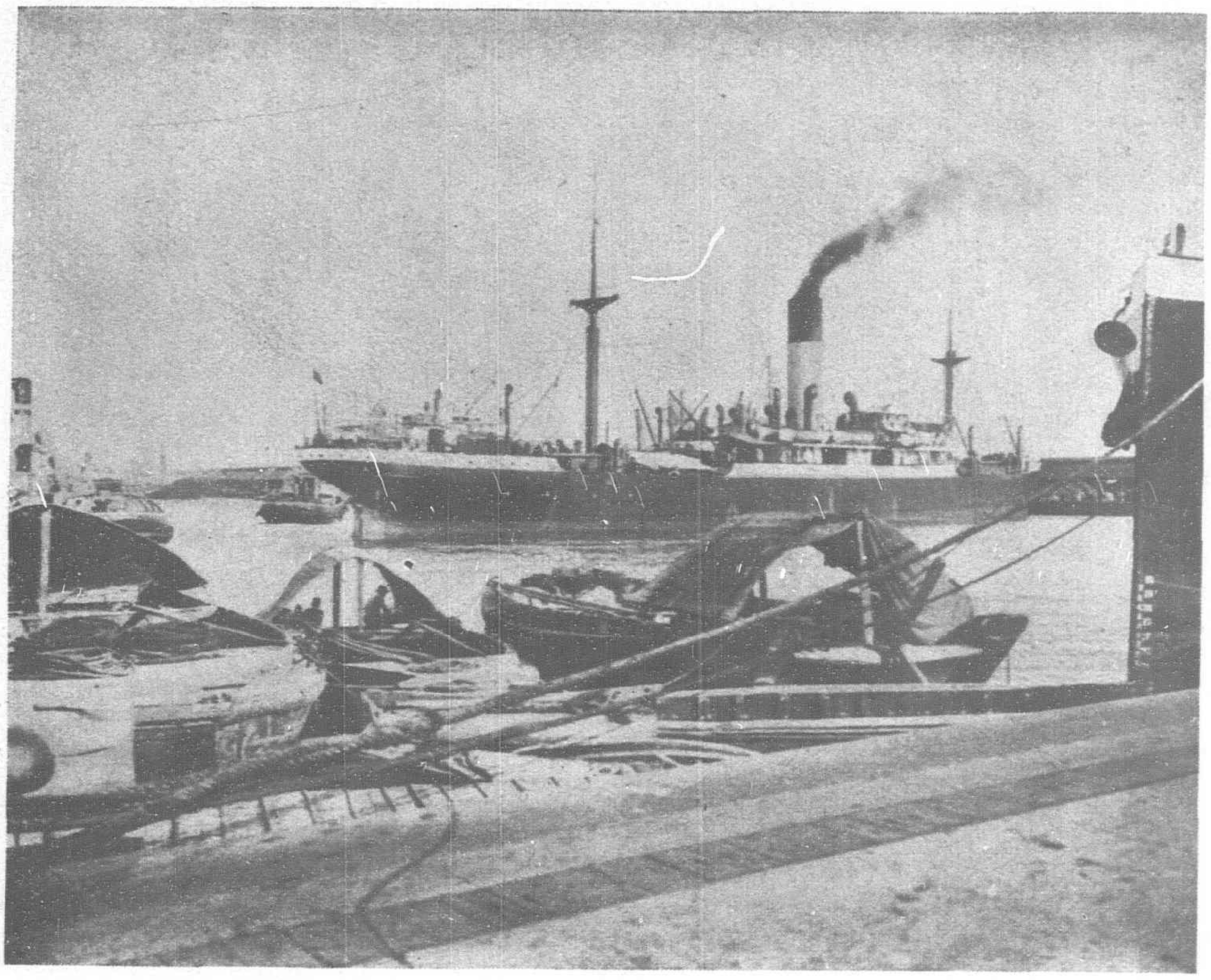
The Board pays to Government interest at the rate of 4 per cent per annum on the capital cost of the Undertaking and loans for New Works, and contributes to a sinking fund therefor at the rate of 1 per cent per annum.



Armstrong Whitworth Crankshaft Lathe, Singapore Harbor Board's Workshops



Churchill Grinding Machine in Workshops



Singapore Harbor Board: Shipping in Empire Dock

The Assets and Capital Outlay of the Board at June 30, 1932, totalled $79,791,202, i.e., £9,308,973 sterling (exchange being fixed by Government at 2s. 4d. per Straits Settlements dollar).

The Board has its own Police Force, and Fire Brigade fully equipped with modern motor fire floats, motor fire engines, smoke appliances, etc. The Board lights its premises throughout and controls all traffic thereon, does all road making and repairing. It also undertakes the entire sanitation and scavenging of the premises and maintains a medical staff and motor ambulance.

The following is a concise description of the Board's Wharf and Dock accommodation :—

WHARF DEPARTMENT—QUAYAGE

Position	*Depth of Water at L.W.O.S.T. less than 25-ft.*	*Depth of Water at L.W.O.S.T. 25 feet to 30 feet*	*Depth of Water at L.W.O.S.T. 30 feet*	*Depth of Water at L.W.O.S.T. 33 feet and over*
Jardines Wharf..	380-ft.	—	—	—
West Wharf ..	—	—	—	1,260-ft.
Main Wharf ..	—	—	—	3,152-ft.
Sheer's Wharf ..	—	330-ft.	—	—
East Wharf ..	955-ft.	290-ft.	—	—
Empire Dock .. (Area 24¾ acres)	—	—	3,522-ft.	—
Oil Wharf, K.H.	—	450-ft.	—	—
Section 10 (late P. & O. Wharf)..	—	800-ft.	—	—
Total: 11,139 lineal feet of wharves..	1,335-ft.	1,870-ft.	3,522-ft.	4,412-ft.

The Suez Canal taking vessels of 31-ft. draught indicates the requirements of Eastern ports in respect of depth of water. The walls of the Empire Dock are designed to permit of it being deepened from 30-ft. to 33-ft. L.W.O.S.T.

There is storage capacity for about 260,000 tons of cargo and some 150,000 tons of coal on the Board's premises.

The Board owns steam tugs with complete fire and salvage plant; sheer legs with maximum lifting capacity of 60 tons; electric, stationary, steam and pontoon cranes, launches and other appliances (including a fleet of 50 lighters, mostly of 50 tons capacity) for the expeditious handling of cargo.

The railway system of some fourteen miles of meter gauge laid track connects the whole premises with the Federated Malay States main railway system for the interchange of traffic.

The Board obtains fresh water of excellent quality direct from the Singapore Municipal mains and by means of its own system of pipe lines and connections throughout the premises supplies it to shipping at all berths at the wharves and docks as required.

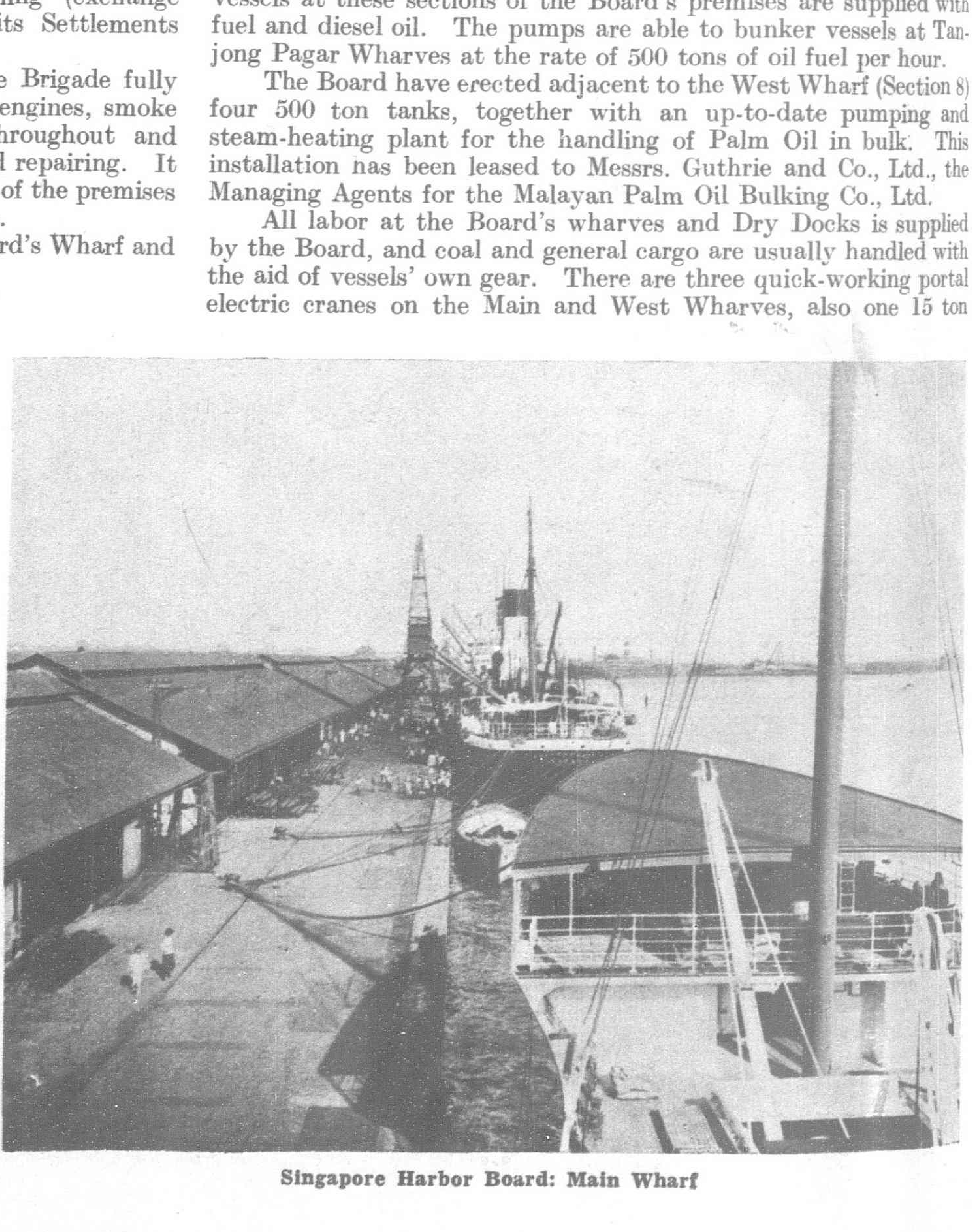
The warehouses for the bonded storage of dutiable liquors, tobacco, etc., are of considerable extent, and have recently been augmented by the additional construction of a fire-proof ferro-concrete warehouse with a floor space 500-ft. by 150-ft. in extent.

Cold storage is provided on the Board's premises by an independent limited liability Company to whom the Board has leased land, and this Company imports regularly large quantities of meat, provisions and fruit from Australia.

The Board has leased an area of land on the East Reclamation to the Asiatic Petroleum Co. (S.S.), Ltd., who have erected thereon tanks for the storage of fuel and diesel oil. The tanks are connected to the Main Wharf (Sections 4, 5 and 6), the north and west walls of Empire Dock (Section 7), and the West Wharf (Sections 8 and 9), by means of 8-in. and 10-in. diameter pipe lines, through which vessels at these sections of the Board's premises are supplied with fuel and diesel oil. The pumps are able to bunker vessels at Tanjong Pagar Wharves at the rate of 500 tons of oil fuel per hour.

The Board have erected adjacent to the West Wharf (Section 8) four 500 ton tanks, together with an up-to-date pumping and steam-heating plant for the handling of Palm Oil in bulk. This installation has been leased to Messrs. Guthrie and Co., Ltd., the Managing Agents for the Malayan Palm Oil Bulking Co., Ltd.

All labor at the Board's wharves and Dry Docks is supplied by the Board, and coal and general cargo are usually handled with the aid of vessels' own gear. There are three quick-working portal electric cranes on the Main and West Wharves, also one 15 ton



Singapore Harbor Board: Main Wharf

electric crane and a stationary sheer legs capable of handling lifts up to 60 tons.

Coal is stored under covered sheds or in the open, and is owned by some dozen steamship owners or merchants. It is chiefly South African, Japanese, Australian, Indian and Welsh, but there is a variety of supplies from local sources such as Borneo, Sumatra, Labuan and Sarawak.

Coal is the only bulk cargo handled at the Board's premises, and the general cargo is of such a varied assortment that the 45-ft. to 50-ft. of quay space between the coping stone and the side of the transit shed is essential for expeditious handling and sorting.

The special feature at the Singapore Wharves is that bunkering operations can be carried on from the shore side (and from the seaside as well) simultaneously with cargo working, thus accelerating the despatch of steamers from the wharves and avoidance of pilotage and other costs for removal to a special bunkering wharf.

The method of handling the coal between ship and stack is for each pair of coolies to carry, by means of a bamboo pole resting on their shoulders, a basket of coal containing 160 lbs. (14 baskets to a ton). The Board pays and charges fixed rates for handling coal, but the Labor Contractor pays so much per basket as it passes the scale on the wharf, the rates varying according to the volume of work on hand, the distance of the carry and the heights of the stack and ship.

A trade peculiar to the East is the conveyance of deck passengers on ocean voyages, and large numbers are conveyed in this manner between Singapore and both China and India, also to neighboring ports, the larger ships carrying two to three thousand each. Further, pilgrims to Mecca travel as deck passengers, and about 12,000 of them embark or disembark at the Board's Wharves annually. When embarking they take with them provisions sufficient for their requirements during the whole journey.

Rates and Charges

There are no Port, Harbor, Dock, Town or Light dues, nor are any berths for vessels or storage places specially appropriated.

The Board charges for the use of the wharves at a rate per ton on the quantity of coal and general cargo discharged or loaded, superseded, however, in a few instances, by a minimum charge against the vessel at a rate per day on the gross tonnage of the vessel when the combined wharfage charges on coal and general cargo do not equal the minimum charge.

The ordinary charges against steamers, mainly for wharfage and stevedorage on general cargo, amount to about \$0.95 (2s. $2\frac{1}{2}$d.) per ton, but on coal, labor discharging only is payable by the ship, the owner of the coal paying the inward and outward wharfage and all labor on the wharf.

Free storage is allowed for goods removed from the Transit Sheds within 72 hours from the time the vessel completes discharge, and there are further substantial concessions for transhipment cargo.

DRY DOCKS

	Extreme length — Length on Bottom ft.	in.	*Breadth at Entrance* ft.	in.	*Height of Sill above Bottom of Dock* ft.	in.	*Depth of Sill at High Water Ordinary Spring Tides* ft.	in.
No. 1 Dock	396	6	47	4	4	0	14	0
	380	6	45	0				
No. 2 Dock	463	0	64	0	2	0	17	0
	440	0	52	0				
Victoria Dock	484	9	64	9	2	9	20	0
	460	0	56	5				
Albert Dock	496	7	59	6	3	0	21	0
	471	0	55	9				
The King's Dock	879	0	100	0	4	6	34	0
	873	0	93	0				

All the dry docks are closed by caissons, and the King's Dock is divided by an intermediate caisson into two docks of 486-ft. and 325-ft. each, and the equipment includes a 30 ton electric travelling crane.

The Board's workshops, all of which are served by overhead electric travelling cranes, are extensively equipped with up-to-date appliances, electrically driven, and are capable of effecting repairs to vessels of the largest class, and their machinery, either steam or motor driven. Machines, capable of grinding either externally or internally the largest parts of motor machinery, are installed. Castings and forgings of the largest size can be made on the Board's premises. Welding, either by the oxy-acetylene flame or by electric arc, is carried out under the supervision of qualified European welders.

The Board possesses its own steam-driven power station, generating a three-phase alternating current supply at 3,100-volts 50-cycles. This is transformed down in various substations to 400-volts for power and 230-volts for lighting. The station is well equipped with modern turbines (three Brush Ljungstrom, one Fraser and Chalmers and one Parsons), having a total capacity of some 5,000 kw. with ample provision for extension as required. The boiler house is also equipped with four Babcock and Wilcox and two Niclausse boilers of the Marine-Land type, complete with self-contained superheaters, economisers, and mechanical stokers. In addition to the normal A.C. supply of 400-volts for power and 230-volts for lighting, provision is made by means of suitable motor generators for giving ships supplies of direct current at various voltages from 65 to 230 whilst they are undergoing docking or repairs, connection being made direct to the ship's switch-board. Supplies of direct current are also available by the use of motor generators at any point of the wharves and docks for the purpose of electric welding. The electrical workshop is equipped with modern electric welding and cutting plant, and all classes of electrical repairs, from small instrument work to the largest of motors or generators, are carried out.

Automatic telephones are fitted throughout the premises and on vessels alongside the wharves, in direct communication at all times with the town exchange via the Board's own automatic exchange.

Salvage Equipment

The Board's salvage equipment consists of two powerful oil-burning salvage steamers, the *Varuna* and *Tunda*. The former is fitted with a salvage and fire pump having a capacity of 600 tons per hour, and the latter with a pump having a capacity of 300 tons per hour. Both vessels are fitted with "Filtrators," which enables them to supply steam for an indefinite time without the necessity of refilling their water tanks; also electric searchlights. A large number of petrol, and steam-driven portable pumps ranging from $4\frac{1}{2}$-ins. to 15-ins., with all necessary pipes, etc., are always kept ready for immediate use.

The following figures give an indication of the volume of the Board's operations.

Year ended June 30th	*Vessels berthed*	*Nett Registered Tonnage*	*INWARD*			*OUTWARD*			*Gross Revenue*	
			Fuel Oil	*Coal*	*General Cargo*	*Fuel Oil*	*Coal*	*General Cargo*	*Wharves*	*Docks*
			Tons	Tons	Tons	Tons	Tons	Tons	\$	\$
1914	2,685	5,795,091	—	679,198	888,598	—	650,552	566,748	3,611,105	2,056,680
1923	2,297	5,630,825	122,581	253,994	732,773	1,117	325,180	483,112	4,257,627	3,342,110
1931	3,447	10,080,436	96,437	204,126	1,031,160	105,716	215,006	849,730	4,606,902	2,780,597

Tin Dredging in the East*

Some of the Difficulties and Troubles Encountered in the Course of Modern Dredge Work

By H. ECKHART

THE many interested parties who watch and check the performance and output of a tin dredge operating somewhere in the East from an office a few thousand miles away have often but a hazy idea of the causes responsible for the loss of anything up to 20 per cent of the possible running time month after month. They often feel that either the management is at fault in outlining and directing operations or that the dredge crew is not up to requirements. They wonder also why the monthly returns reveal an output of barely 60 per cent (in many cases very much less) of the readily-calculated theoretical capacity of the machine. Recommendations to speed up are made (without increasing the already high repair bill, running any risks, or shortening the " life " of the plant as a whole). Running costs are too high (but the best of dredges refuses to work on air and less than the absolutely necessary minimum of hands cannot be employed until we have a " Robot " dredge).

Difficulties connected with tin dredging are grossly underrated and hardly any one realizes the complexity of a modern dredge, which embodies the work of almost all branches of mechanical, electrical, and structural engineering, not to speak of the most important—because only paying—part, the metal recovery section.

Much has been written on dredges. Plants have been described and illustrated and performance records published, yet very little has been mentioned of the difficulties and troubles facing the dredgemaster and his crew. To acquaint those who wish to gain a closer insight into actual happenings of the causes of stoppages and, therefore, of lost time and to enable them to analyse the design, performance, and efficiency of some of the more important parts of a modern tin dredge is the principal object of this article and much of what follows is history and, as such, is well known (or should be well known) to the designer or the consulting engineer. The writer has been connected with the tin-dredging industry as engineer-designer for many years and has long, practical, " on-the-spot " experience to back his arguments, statements, and criticism.

Difficulties and troubles can be divided into two classes—

(1) Those due to conditions prevailing at site and

(2) Those experienced with units or parts on the dredge.

An examination of the site-plan of a concession often shows irregular and jagged contour lines. With a studious regard for the interests of a " company-to-be " the mining engineer selects the most suitable (and remunerative) area for dredging and carefully includes every bore-hole of value. The resulting boundary lines are frequently not unlike a jig-saw puzzle. To solve this—that is to say, to get every cubic yard of material even along the boundary line—is one of the tasks of the dredgemaster, but, be he never so experienced and his staff never so reliable, he cannot succeed if the machine does not allow him to. To be able to turn the dredge and get right into corners the bows may require narrowing very considerably, much rake—that is, taper—at the fore-end may have to be given, and ample head-cut—that is, distance from fore-end to lip of cutting bucket when ladder is at about water-level—yet no more than is necessary, be allowed. If the designer understands the importance of this and designs the bows to answer unalterable requirements many hours of useless manœuvring, much needless argument, and, incidentally, much " forceful language " are saved, quite apart from recovering what may be good values. Head-cut and rake at fore-end play an important part also in dredging high banks. A concession in the East is not always a piece of flat ground. Rises up to 20 feet may have to be negotiated. To do so without undue risk to the plant and without losing much time the digging end of the dredge must have been suitably designed. There is no such thing as a hard-and-fast standard. An alteration in the digging end of the ladder involves accompanying alterations of other parts of the dredge, but this, perhaps, is outside the scope of the present article.

Unless accidentally discovered during boring, a site and boring plan does not indicate the presence of buried timber and even if logs are never struck during the " life " of a mine one would have to be abnormally fortunate if one never had to dredge up roots of some erstwhile giant of the jungle, while large boulders are another nuisance the dredgemaster may have to contend with. Dredging up buried logs is a laborious, slow job, requiring great care and good " winching." Once floating the dredgemaster should have facilities for expeditious handling, but it requires more than the common jib crane of about three tons capacity usually provided by well-meaning designers. A slewing crane with travelling trolley and a lifting capacity of from 10-15 tons serves the purpose. It should be so designed and placed that its end can be swung right over the bottom tumbler, if necessary, and lift same. Best practice provides for a special winch for the operation of such a crane.

Even on some of the most up-to-date dredges it is palpably evident that the " tailings question " is not yet properly understood or, if understood, its importance is under-estimated. This has often caused a considerable decline in the monthly yardage inasmuch as even nowadays it happens that tailings " come in " to such an extent that they are again picked up by the bucket-band. The suction (and boiling) effect at the face is so great that the lighter—that is to say, less bulky—tailings are dragged a very considerable distance. Experience has shown that the lowest part of the tailings " heap " has at times an " angle of repose " of less than 10°. The importance of depositing tailings sufficiently far aft effectively to prevent any possibility of redredging is self-evident. The sandier the ground the greater the risk.

One of the worst bugbears of the dredgemaster

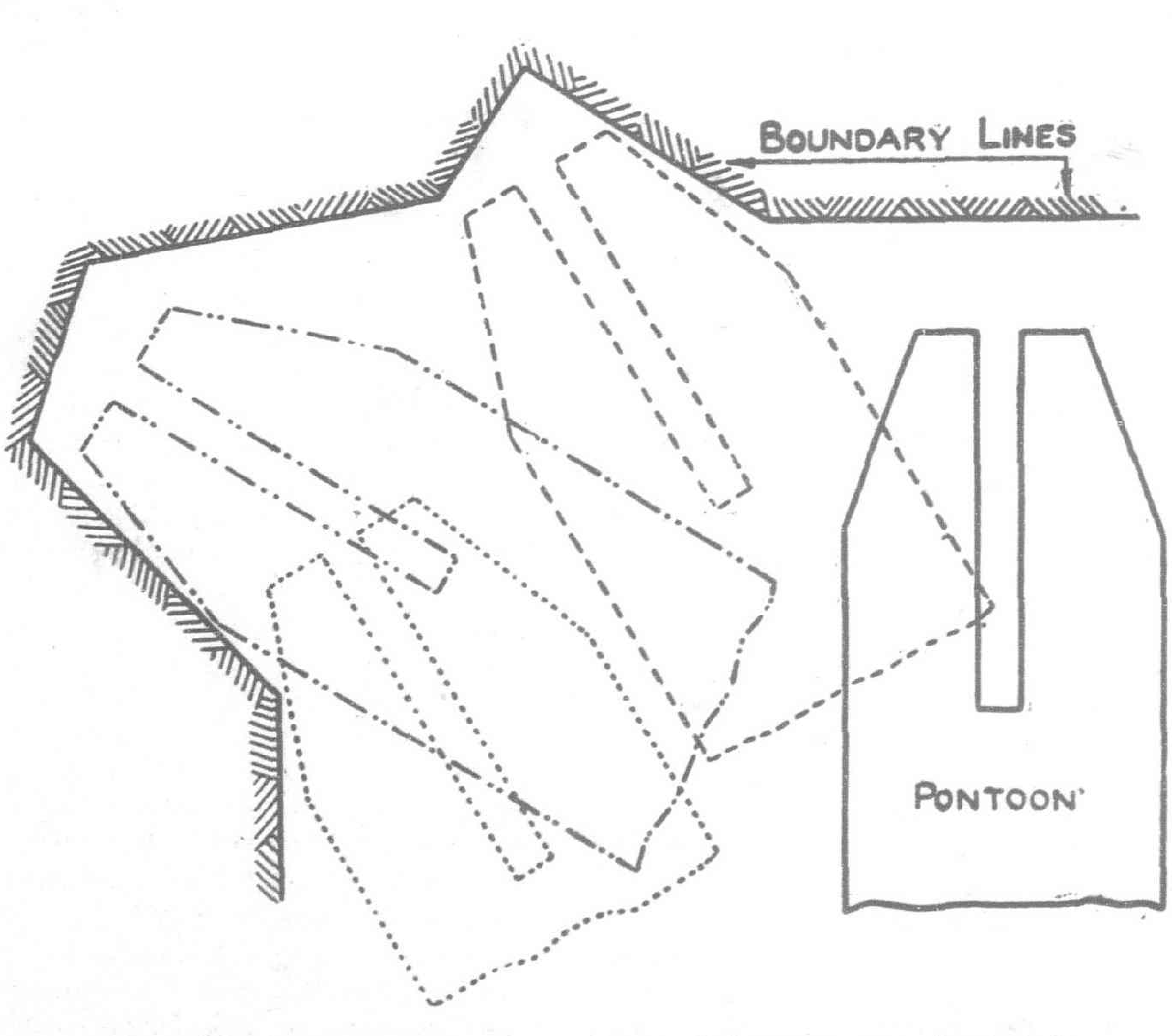


FIG. 1.—THE IMPORTANCE OF THE BOWS—" GETTING INTO CORNERS."

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*The Mining Magazine

is the dredge paddock. In most cases it is an almost continuous source of trouble and worry, for it must be known that very often the whole dredge paddock is a semi-glutinous mass of the consistency of very thick pea-soup, all but about 9-12 inch at the surface. Dredges have had to stop working for many hours and days even, all on account of lack of water. It causes a nightmare at times to devise ways and means to get make-up water, to rid the paddock of at least some of the slurry and slimes (and deposit same at some far-distant place without incurring the displeasure of the watchful eye of a Government inspector), to prevent the pumps getting choked, and to minimize wear of pump runners, liners, shafts, and valves, for "the soup" very quickly produces polished surfaces and razor-sharp edges. If water—i.e., clean water—gets scarce slurry pumps are employed to remove some of the troublesome "soup" and allow fresh water—whatever little there is—to take its place. If for any reason the cost of a slurry pump installation cannot be entertained, big syphon pipes are used and are known to have done excellent service. The consulting engineer or the designer can materially help by providing a good pump screen so designed that it takes water only a few inches down from the surface. He should know and appreciate that the trim of a dredge alters with the depth of the ground dug and that the freeboard changes frequently. He should also remember that there is much weed, grass, and wood floating on or just below the surface and that unless he makes provision to keep this away from his perforated pump screen plates much manual labor is involved in doing so. No amount of labor can, however, prevent some of the perforations becoming clogged. This is but one of the reasons why the total area of perforations of a pump screen (holes not more than 1-in. in diameter) should not be less than five times the combined area of suction pipes of pumps to be fed by the screen. Writing from experience and taking an average size of pumps, pump screens should have a length of about 40 feet, or more even, and be so constructed that the cleaning of plates can easily be done.

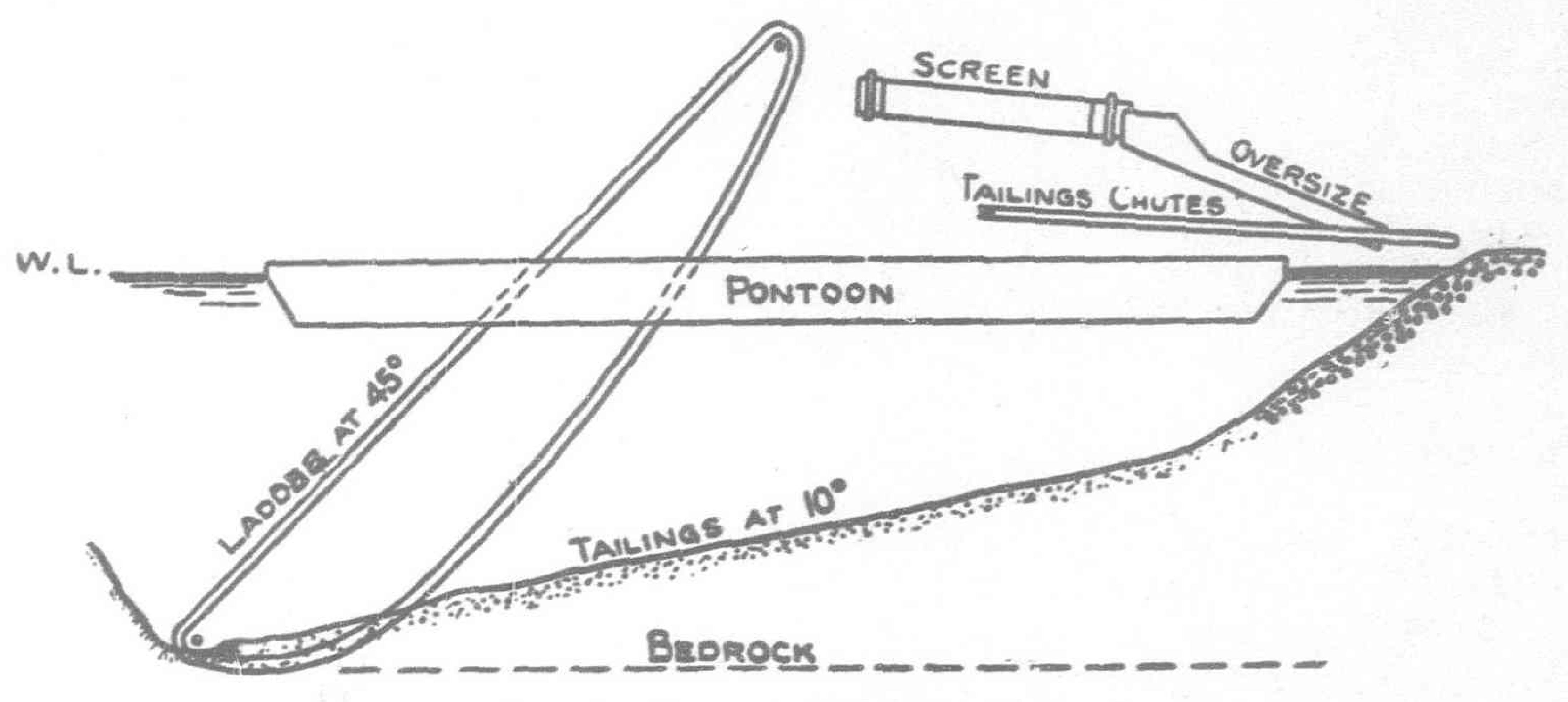


FIG. 2.—TAILINGS "COMING IN."

It goes without saying that when dredging in a river bed or the sea or places where there is an abundance of water—and where slimes can be led off undisturbed—some of the above remarks lose much of their poignancy. Such cases are, however, more the exceptions than the rule. A dredgemaster dredging a river often meets other snags in the shape of Government regulations relating to slimes, contamination of river water, and the like.

It is generally acknowledged that a tin dredge, no matter how carefully designed, cannot be built so as to answer stability laws completely. There is no danger longitudinally. Whether the ladder is up or down and the stern empty or loaded (with 150-250 tons of dredged material) the change in longitudinal trim causes the dredgemaster very little concern or inconvenience—that is, if ordinary care was exercised during design. Transverse instability, however, is a serious matter and the dredgemaster or winchman has to be ever on the alert. An inclination of only a few degrees may result in capsizing and an inclination of a few degrees can be brought about quite easily if insufficient attention is paid to proper distribution of loading at the stern or if an even distribution is for any reason not feasible to proper balancing. As a precautionary measure it is well to have a large pendulum hung in the middle of the pontoons at or near the main frame and a graduated scale showing the amount of list. The man in charge of distribution to jigs or boxes should keep a watchful eye on this.

Troubles on the dredge begin at the bows and finish at the stern. One may say they are continuous almost throughout the length and breadth of the machine. The time—and, therefore, yardage—lost over removing boulders and roots or small logs from the bucket line can be very considerable. The facilities for dealing with this work are, in the writer's opinion, insufficient. It does not take long to stop the bucket drive, make away with whatever should not enter the screen, and restart, but if this has to be done frequently hours can be saved if quick-acting and easily manipulated tackle, such as self-closing hooks, is available.

The bucket band, with its tumblers, ladder rollers, and bearings, is the most costly part of a dredge to instal and a regular trouble-spinner. The bucket pin of modern design is an example to hand. Be one never so careful, pins begin to "work" not long after they have been fitted. This means quick wear and pins and bushes are costly things to replace. Aware of the disastrous effects this "working" of pins has on the repair bill and particularly on the hours actually worked—in other words its detrimental influence on yardage—many ideas have been tried to remedy the defect and patents taken out. The writer knows of no better means than grooves milled (or ground) in the "L" head of the pin, with corresponding grooves in top and bottom of recesses left on the bucket and steel wedges driven in. Countersunk bolts—irrespective of size—are unsatisfactory, any practical man will confirm this. At the same time anything in the nature of a forcing screw is sure to give early trouble of some sort.

Ladder rollers and bearings wear quickly and are ugly parts to replace because of the time taken to do so. These parts are sometimes of a design far too elaborate and costly and are no better than simpler and cheaper ones. Prepared to evoke criticism, the writer maintains that "self-adjusting" bearings (known also as "the hinge type") are an unnecessary refinement and, to an extent, risky. Merits of any particular type can only be ascertained by comparing its dependability, life, and cost with other types. Performance records kept by some companies appear to offer fairly conclusive proof that an ordinary cast-steel stool, bushed, grit-proof, with facilities for ample and easy greasing and for taking-up thrust, is the most satisfactory construction from a practical viewpoint and is time-, labour-, and cost-saving.

The top tumbler end of the digging part of the dredge presents difficulties which are, speaking generally, not thought of and hardly ever fully appreciated. Losses at this end can—and do—seriously affect the tin output. The parts most responsible for this are the buckets themselves, the design of the hole into which they discharge, the drop chute, and the save-all. When a bucket of a close-connected line discharges a lot of material hits the back of the preceding bucket and is partly lost owing to more or less ineffective and weak construction of the splashplates. If merely dredging overburden these splash-losses are of no account. If on "karang"—that is, tin-bearing sands—splash-losses mean money losses and the dredgemaster "gets it in the neck" undeservedly. Next in importance are losses in and at the drop chute, caused by splash and by some of the discharged materials not entering the chute at all. They can never be totally avoided, but can be minimized, although not by the dredgemaster. As far as the drop chute itself is concerned the obvious thing to do is to place the leading edge as close to the bucket lips as the catenary of the descending bucket line permits, remembering, though, that the curve changes with the dredging depth and the tightness or slackness of the band (as far as the latter is concerned the remedy does lie with the dredgemaster). Although an "automatic chute" (a swinging chute, link-connected to the bucket ladder) offers a better chance than a fixed chute to curtail losses it is far from satisfactory, has distinct disadvantages, and is often looked at with disfavor. Having closely watched a number of plants the writer is convinced that too much value is set on amount of "drop" (the vertical distance between top tumbler and drop chute). The inclination of the chute is of much greater importance than the drop and should on no account be less than 30° to the horizontal. Another source of annoyance to the dredgemaster and his crew is the save-all and for the following reasons: It is generally too steep or too shallow and does not ever catch as much of the spillings as one would wish it to do. Rarely ever does one find facilities for changing grizzly bars and few designs allow for easy cleaning or for getting at the sump. A correctly-constructed save-all is a money-earner. By altering the design and installing a new one, one company in the East secured over two piculs of tin oxide per week from the save-all sump.

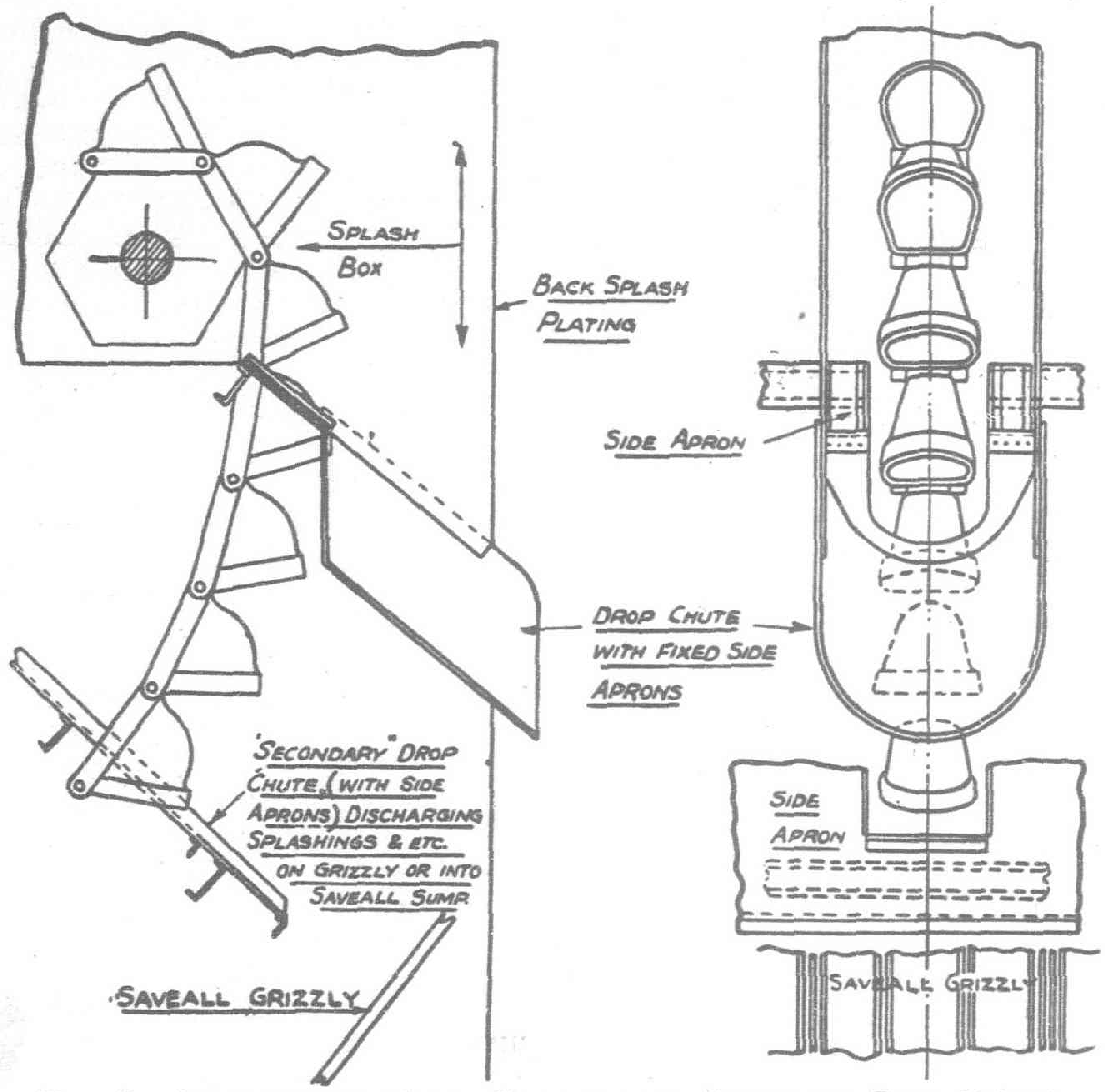

Splash Box
Back Splash Plating
Side Apron
Drop Chute with Fixed Side Aprons
"Secondary" Drop Chute, (with Side Aprons) Discharging Splashings & etc. on Grizzly or into Saveall Sump
Saveall Grizzly
Side Apron
Saveall Grizzly

FIG. 3.—ARRANGEMENT OF THE PRIMARY AND SECONDARY DROP CHUTES.

To see bucket after bucket discharging the bulk of its contents not into the drop chute but back into the well and so losing good values is anathema to any dredgemaster who takes an interest in his work. Sticky, clayey wash adhering to the inside of the bucket refuses to budge as the bucket passes over the tumbler, nor does its bulk and weight tell until long after the bucket has passed the drop chute. Improvements can easily be made by installing a system of clay tines at or near the top tumbler, digging into and operated by the buckets, similar to an arrangement first introduced by the Yukon Gold Company at Ampang. It is practically fool-proof and works very well. While discussing this with the management of the company mentioned the writer suggested also an alteration in the shape of the inside of the bucket—all cross-sections taken parallel with the mouth of the bucket to be elliptical—resulting in what has been called a "saucer bucket." Size for size, the saucer bucket has less capacity but discharges much better than the usual type.

The treatment end of the dredge is just as troublesome as the digging end. Of all the many parts which go to make up a tin dredge the revolving screen is surely the most cumbersome and unsatisfactory. Here is a cylindrical shell, anything up to 10 feet (or more) in diameter and some 60 feet (or more) long, weighing nowadays sometimes more than 45 tons, perched on a maze of structure, perhaps over 30 feet above deck, slowly revolving yet sometimes drunkenly swaying—a money-swallower of the first water, wanting careful looking after. The writer considers that there is here vast scope for improvement. If experiments were carried out in the right direction they would almost with certainty materially change the design of the screening and disintegrating plant at present employed and would considerably reduce cost of upkeep, time lost, worries, and risks. About 70 per cent of the useful work done by the present screens is effected in the first three feet of a perforated shell that may be more than 40 feet in length and of a huge diameter, often made quite irrespective of the kind of material that is to be treated. It is not surprising to find dredgemasters for hours at the discharge end of the screen and to wonder. As the capacity of a dredge increases, so are feet added to length and diameter of screen—quite as a matter of course and quite oblivious of the bogey so created. In a good many instances screens are never worked up to anything near their capacity. Hardly any one has ever seriously troubled about studying the screening problem on a tin dredge or tried to arrive at the maximum amount of various materials the screen can satisfactorily handle. Some years ago the writer determined by experiment the time taken by materials traversing the screens. For similar ground, this time shows nowadays an increase of close on 50 per cent. Yet, samples taken at the screen discharge showed no heavier losses then than they do now.

Turning to the tin-saving equipment. Almost every modern dredge—as also many old plants—employ a number of Harz jigs to treat the screened materials. Most of the new dredges work the jigs in conjunction with classifiers, but the writer ventures to predict that the day is not far distant when classifiers will be done away with. Observations made on many plants indicate that classification is not needed on a tin dredge. It would indeed seem best not even to "size," but actually to mix all screenings thoroughly and partly to dewater them before delivery to the jigs. The advantages of such a proceeding are appreciated by any one who has had to do with jigging on a dredge. Apart from saving much operating gear material, space, and attention, it simplifies the arrangement of feed chutes to the jigs. To the onlooker there is "nothing in jigging and little to worry about," but there is more in it than the eye can see. The Harz jig cannot by any means be called ideal, except perhaps from a simplicity viewpoint. Different screenings require different treatment and the patience of the European in charge is often taxed very severely. Once set as regards correct stroke, best speed, and proper feed, troubles at the jigs are minimized—as long as the material remains of the same order. Not infrequently, however, resetting has to be done just when everything is going well. To facilitate work at the jigs it is highly desirable that a light lifting-tackle is available for constant use, that the jig eccentrics can be finely, easily, and quickly adjusted (and the adjustment be noted without measuring), that speeds can be changed easily, and that there is ample working space everywhere.

It is difficult to convince some people—managers and dredgemasters included—that an installation devised years ago can, from working, efficiency, and economic viewpoints, often be improved upon. When the late Mr. Newson conceived the idea of using jigs on a tin dredge he decided on a four-compartment jig, each compartment three feet wide by four feet long and having a drop of some 4-in. at every compartment. Whosoever has worked or experimented with jigs made to these sizes must surely agree that the last four feet of length are waste or worse than waste. The discharge at the spigot is pure sand with hardly a speck of "floating tin," certainly not enough to impair the efficiency of the plant if the last four feet were entirely discarded. One very well-known Australian jigging expert and mining engineer spent much time experimenting on dredges and arrived at the conclusion that much better results are obtained by increasing the width of flow and shortening the length of the jigs, in arranging the jig beds with a continuous fall ($\frac{1}{2}$-in. per foot), and in practically doing away with drops. A number of plants have been built embodying these points and give excellent service, losses being negligible.

When jigs found their place on a tin dredge very little was known about their working capacity, nor was the science of jigging properly understood by dredging people. Tailings losses were high, much higher than one had been led to believe, and by taking the line of least resistance an insufficiency in the number of jigs installed was held blameworthy. The outcome was that specifications called for more and ever more units, but tailings losses continued to loom high and after lengthy experiments and closer study, coupled with a certain amount of luck encountered when wash became unexpectedly free, increasing the amount of screen discharge very considerably and "swamping" the jigs without, however, adding appreciably to the tailings losses, it dawned on the operators that whatever applies to the Harz type of jig on land probably holds good on a tin dredge. It is not only the number of jigs that counts. In order to give good and satisfactory service the jigs must have something to do. The maximum capacity of a jig is a fairly definite quantity—it amounts to about 0.6 cu. yd. per hour per sq. ft. of screen area. Let any one interested compute the capacity of a jigging plant installed on some dredges—quite modern ones—and he will find that in some cases the whole of the dredged material would have to be sent to the jigs unscreened before these are overloaded to such an extent that really serious losses have to be faced.

The moral of all this is: Get all possible information about the ground to be dredged; estimate the probable digging efficiency of the plant at a high figure (but remember that, under the absolutely most perfect conditions and assuming winching to be first class, output is never going to exceed 70 per cent of the theoretical capacity); decide on a likely screening factor (that is, what percentage of materials entering the screen will be available for jigging); then—and only then—compute the jigging area required for efficient, yet economic, treatment. After having arrived at the number of jigs necessary add two as standby; it is all to the good of the plant and to the best interests of the company.

Another item worth mentioning, because it sometimes leaves very much to be desired, is the lighting arrangements on the dredge and one cannot lay too much stress on the importance of this. A well-designed, well-constructed, and well-handled tin dredge (working 24 hours, seven days a week) can lose much of its efficiency by an insufficient system of lighting. At the bows and illuminating the face there should be at the very least one powerful floodlight (1,000 watts is not too big) so arranged that it can swivel in any direction. If, in addition to this, two smaller floodlights (of about 400 watts) are arranged (one at each corner of the bow gantry) it is all the better. There should be a cluster of about 400 watts on the bow gantry (over the tumbler) with a similar one in the ladder well. Suspended from the roof trusses a total of about six clusters of, say, 400 watts each should be installed between bow and stern. There should be at least two clusters of about 200 watts over the main gearing and one each on port and starboard side at stern of dredge. The stern should also have a swivel-type floodlight of about 400 watts. Lamps used on a tin dredge should be not less than 60 watts—100 watts for preference. Each jig requires about two lamps, the pump screen three or four, and, as every unit of the dredge must have at least one "point," one can reckon with about 40 lamps for average conditions, apart from floodlights, clusters, and some 12 or more wall plugs and portable lights. The big expense of an elaborate lighting system will be amply repaid—and in a very short time—by easier and better attention paid and time saved (therefore better time worked).

In the case of an electric dredge operated from a pilot house it would be of great advantage if means were provided for instant communication between a number of places on the dredge and the pilot house. With the very large dredges built nowadays shouted orders miscarry or are easily misunderstood and not properly carried out. To obviate this a bell or signal system should be installed or, better still, loud-speaking telephones fitted in different parts of the dredge. Indeed the desirability—if not necessity—of such an installation is not confined to electric dredges only.

More time is lost and more inconvenience caused by the lack of suitable tools on board a dredge than, perhaps, is generally realized. It is sinful at times. It should not be forgotten that a complete kit of engineer's, electrician's, boilermaker's, blacksmith's, rigger's, and, to a less degree, carpenter's tools is wanted. There should be a portable electric drill, a small fixed drilling machine, a portable forge, and, if finances allow, a cutting and welding outfit. There must be wire rope slings, chain blocks, pulley blocks, and pulleys, all of which should be on the dredge, not in a store a mile or more away, to be sent for as required. The necessity of a lock-up tool room need not be emphasized. To those who have worked in the East the reason is obvious. And all tools should be available from the day the machine starts.

To what extent the general lay-out of a dredge, the power and pumping units, the design, arrangement, and operation of driving gear, manœuvring gear, and many other details which are, as a rule, considered unimportant affect the smooth working is outside the scope of the present article. The writer has attempted to offer creative criticism relating to some sections of a dredge and if his remarks are accepted in the spirit in which they are written he will be satisfied.

Wireless Amenities between Berlin and Tokyo

One beautiful morning in November, an illustrious company of Japanese and Germans met in the "Haus des Rundfunks" (Broadcasting House) in Berlin on the occasion of the first attempt to secure direct wireless transmission from Japan to Germany, and from Germany to Japan. In addition to his Excellency Baron Nagai, the Japanese Ambassador in Berlin, who was to speak from Berlin to Japan, the gathering consisted of Mr. Fujii, Councillor of the Embassy and wife, Dr. Sakaya, the Secretary of the Embassy and wife, Lieut.-Colonel Banzai, the military attaché and family, Captain Yendo, the naval attaché and wife, as well as Dr. Imai the first secretary representing Dr. Nagai, the commercial attaché who was absent from Berlin. Several officers of the Japanese Military and Naval Mission were also present, and the President and Board of Directors of the "Japanese Association with Germany," Lieut.-Colonel Ogura, Professor Sato and Captain Miyamoto, Dr. Ohta from the Japanese Government Railways and Messrs. Hatanaka, Iino and Takenouchi Directors, Professor Kuroda and Dr. Ramming of the Japanese Institute, Admiral Behncke, President of the German-Japanese Company, as well as Dr. Hack as German, and Mr. Sakai as Japanese, secretaries, Dr. Krull, Consul-General from the German Foreign Office, and lastly several representatives of the Japanese and German Press. The ceremony commenced with a speech of the Japanese Ambassador, which was delivered first in Japanese and repeated in German, of which we give the following extracts:

"I am now standing in front of the microphone to speak to Japan from Germany where I am exercising my office. This occasion marks a wonderful and amazing progress in the possibilities of intercourse between Europe and the Far East!

It is now a well-known fact that Japan has learnt much from Germany. On the other hand, Germany too has learnt to appreciate Japanese Culture and Japanese Art. The German nation is thrifty, upright, industrious, reserved, possessing great inventive genius, deeply reflective, and animated by the spirit of Truth. These qualities are most admirable, and the appreciation of them is most deeply embedded in those who, like us, are living in Germany and have opportunity of observing the German national character practically every day. The fact that several Japanese come to Germany and pursue their studies and investigations in such an atmosphere will serve to encourage a further approach, and develop still more friendly relations between Japan and Germany. On the other hand, many Japanese come here who are specialists in the most varied Branches of Culture. They come into contact with German experts as their colleagues, and show them the results of their widely prosecuted studies. To quote a few examples: Japanese Tennis Champions have displayed their splendid skill here, and the worthy founder of 'Judo' has visited Germany to explain the principles of this chivalrous sport. Our famous conductor has revealed the rhythm of ancient Japanese music, and has thus shown what wonderful and inestimable treasures have been produced by our traditional Culture during the last two thousand years, for which he received general and unstinted applause. Visitors to Germany at the present time are particularly impressed with the preservation of Law and Order as well as by the fact that the nation as a whole goes about its daily work without let or hindrance, in spite of the mighty change undergone in its system of government ever since the National Socialist Revolution last Spring.

The following verse is from the pen of a German poet:

"Ans Vaterland, ans teuere, schliess' dich an!
Das halte fest mit deinem ganzen Herzen!
Dort sind die starken Wurzeln deiner Kraft!"

(Cleave to thy beloved Fatherland, hold it fast with all thy heart, for there are the strong roots of thine own power).

How could we Japanese do otherwise than be touched by the same sentiments expressed in such a verse as this?"

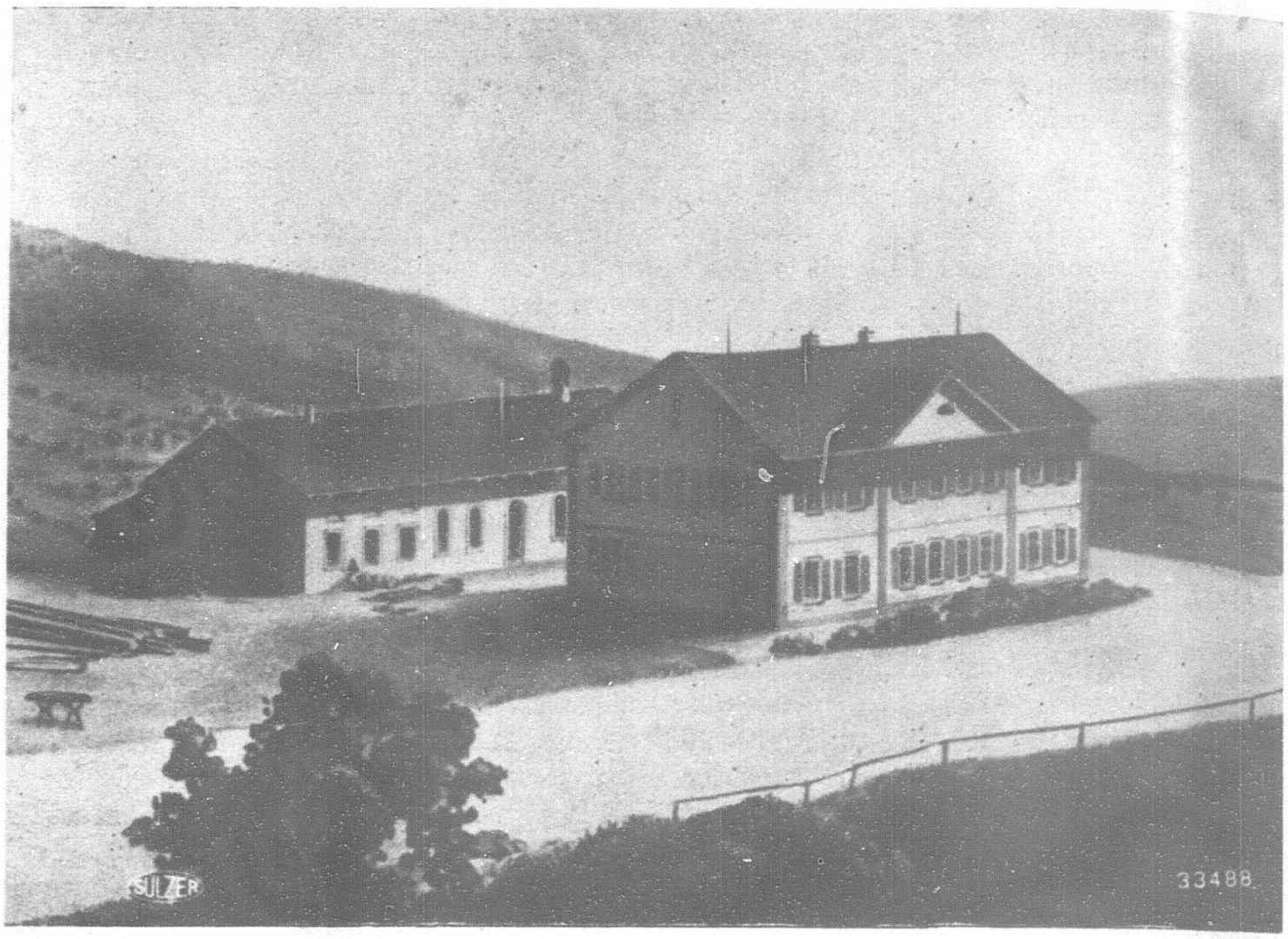
The Japanese National Anthem was sung on the conclusion of the speech. Dr. Voretzsch, the German Ambassador in Japan, then followed with a speech in which he drew attention to the soul of the Japanese nation which even to-day was far too little known and understood, as well as to the glorious and sacred traditions of Japanese Culture. Japan, too, has its Frederick the Great and its Bismarck; Japan, too, had its national upraising in the past as well as the present. On the eve of returning home, the Ambassador was pleased to seize the opportunity of publicly expressing his admiration of the Japanese. According to telephone conversations, the German transmission was perfectly received in Tokyo, with absolute clearness, and without the slightest disturbance. It was received and broadcast by twenty-seven stations in Japan, Manchoukuo, Corea and Formosa.—*Ubersee Post.*

Centenary is Celebrated By Sulzer Brothers

1834-1934

This year marks the centenary of the foundation of the firm of Sulzer Brothers. The business has risen from small beginnings. Two young and enterprising brothers started it, guided by the wisdom and experience of parents who had brought them up under the simplest conditions. Accustomed from an early age to hard work, self-restraint and a sense of duty, they believed firmly in the reward of perseverance and the power of personality.

As a workshop for the manufacture of products required in Switzerland, firstly for the textile industry, the firm attained a noteworthy position within a few years. The iron foundry with which it orginated developed rapidly and " The Foundry " remained the popular term for the works at Winterthur for many decades. Then followed the installation of steam heating plants and the manufacture of steam boilers.



First Workshop and Dwelling House of Sulzer Brothers Established in 1834 at Winterthur

A new era commenced in the fifties when the brothers Sulzer took up the design and construction of steam engines and from then onwards specialized more and more in this direction. The steam engine brought to the name " Sulzer " world significance. The engine—as Matschoss writes in his history of the steam engine—became the prototype of the steam engine in Europe. This carried in its train the building of lake steamers and subsequently refrigerating machinery, reciprocating pumps, and gas compressors. Towards the end of the last century the firm attained further success in another direction. In Winterthur the high-lift turbine pump was evolved, which subsequently revolutionized completely the method of handling liquids and then rendered possible the economical solution of certain technical problems, forcing the reciprocating pump into the background.

The mainstay of the undertaking was and remained the heat engine. When the field hitherto monopolized by the reciprocating steam engine was challenged by the steam turbine and Diesel engine, Winterthur carried out valuable pioneer work in turbines, but eventually decided in favor of the Diesel engine.

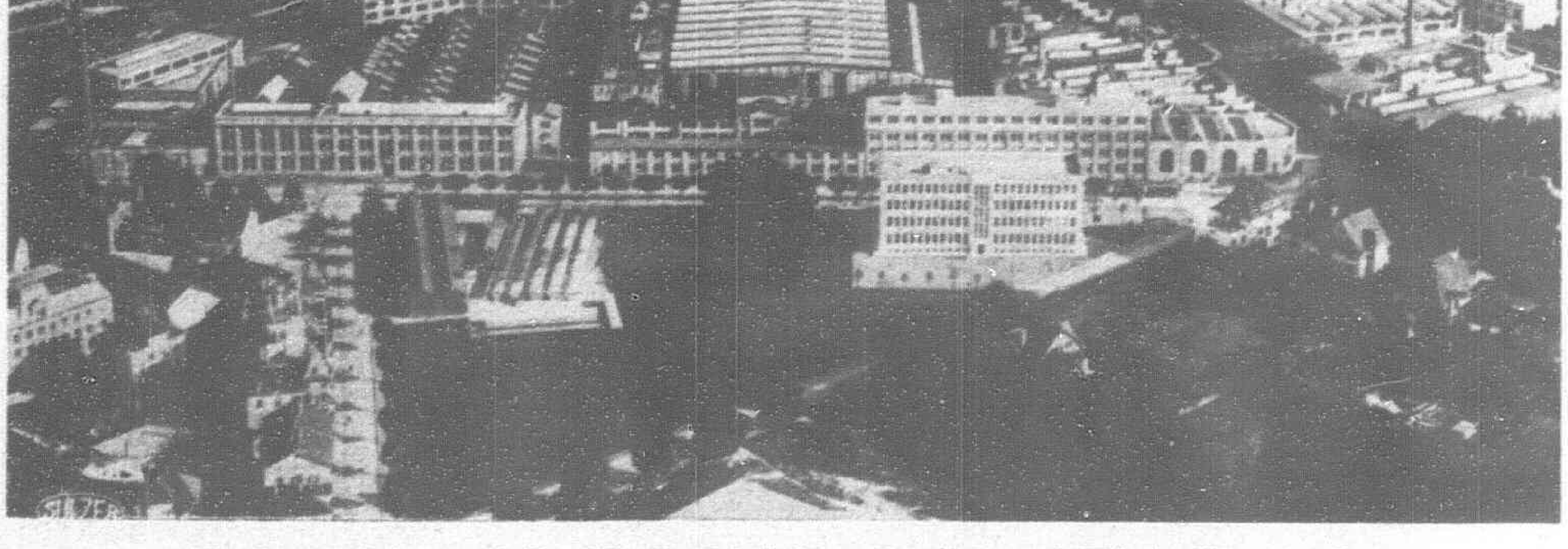
Since the end of the Great War the principal designing and manufacturing activity of the firm—apart from steam engines, boilers, large compressors, centrifugal pumps, fans, refrigerating machines and central heating plant—has been in the domain of the Diesel engine, which has been developed not only for large stationary units, but also as a reversible engine for marine purposes and latterly for rail traction.

Whilst the sale of the firm's products in the time of the founders was confined almost entirely to the Swiss home market the success of the Sulzer steam engine in the time of the second generation created a market extending far beyond Switzerland.

The large disparity between export and home markets necessitated foresight to avoid danger to the economic foundations of the undertaking, which had already become apparent in the time of the second generation. Thus, when Germany erected a protective tariff wall—aiming at the development of a powerful industry of her own —the firm was compelled to start works in that country in order to retain the important German market. This tariff however did not completely shut out Swiss products, which due to their high quality still found entry into Germany, while the other world markets remained unrestricted. The ascendancy which the firm had acquired by its initiative and enterprise was maintained and rendered possible a further healthy expansion of the Swiss works.*

Competition amongst the nations, however, grew appreciably keener, and the acuteness of this situation, which had already made itself felt before the Great War, confronted the third generation with new and difficult problems. In order to uphold its position the firm was compelled further to extend its manufacturing activities to foreign countries either by association with other firms or by granting licences. Particularly successful was the conclusion of licence agreements for marine Diesel engines, a policy which has been consistently followed since the War.

The system of licensing plays an important part in the firm's history. A network of co-ordinated interests with the licensees extends throughout the world, whereby contact is also retained with protectionist countries. The payments resulting from such licences constitute a welcome contribution to the considerable funds necessary for research work of the parent company and the evolution of designs, which need to be based on large scale experiments to meet the demand for units constantly increasing in size. The imparting to foreign licensees of the results of



Airplane picture of the Works of Sulzer Brothers at Winterthur to-day

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*In the years preceding the War only 27 per cent of the output of the Winterthur works was absorbed by Switzerland, 73 per cent being exported. During the years 1924-1930 the percentage exported remained almost constant at a figure of 76 per cent.

this development and research represents an export of high quality intellectual work for which Switzerland alone would be far too inadequate a field.

The works at Winterthur have been extended far beyond the original site to adjoining ground acquired in the course of years. Works have been erected abroad and when no further expansion was possible at Winterthur a new factory was built at Oberwinterthur and a foundry at Bülach.

At present the buildings of the establishments at Winterthur, Oberwinterthur and Bülach cover a total area of about 28 acres. They are equipped with 2,200 electric motors representing about 18,000 h.p. In the foundries 13 cupolas are available with a total melting capacity of 79 tons per hour, and there are in addition five electric furnaces installed for the production of special cast iron and cast steel. The foundries are also provided with up-to-date chemical and metallurgical laboratories, which in collaboration with the firm's material testing laboratory supervise the quality of raw materials and foundry products. The Winterthur foundries including the brass foundry can deal with an output of over 20,000 tons per annum.

The boiler and sheet work sections were combined in 1925 under one roof by the erection of a modern boiler shop with the most complete equipment. Particular attention is paid to modern welding methods and large fabricated machinery parts are produced either by oxy-acetylene or electric welding. In 1930 a new Diesel erecting bay was built at Winterthur of such dimensions as to permit the convenient assembly and testing of the very largest units.

The comparatively high wages paid by the Swiss engineering industry, the onerous material basis and the necessity of having to sell the bulk of its product abroad in the face of severe competition have compelled the firm to keep the shops equipped with the most modern tools and devices to ensure not only the best quality, but also the highest quantity production, which principle applies also to the works abroad.

In the works at Ludwigshafen-on-Rhine the area built over covers approximately 13 acres. The ground adjoining the site on which dwelling houses for employees and a canteen are erected also belongs to the firm. In Ludwigshafen, apart from the pump and Diesel engine sections, the mass production department of the foundry is worthy of note, being equipped in the most modern manner for the manufacture of castings for the trade, in particular the motor-car industry.

In France the Compagnie de Construction Mécanique Procédés Sulzer was founded at Paris with participation by a group of French business friends, which concern acquired as from January 1, 1918, the sole selling rights for France and Belgium including their colonies and after the end of the War commenced to manufacture at St. Denis. These works are primarily laid out for the construction of Diesel engines, pumps and refrigerating compressors, but also well equipped sheet works and a pipe shop, both with modern welding plant, are attached. The factory has sidings and loading facilities direct into lighters, and it is possible to carry out erections and repairs on ships moored alongside.

The Sulzer concern which since 1914 has been unified in the Holding Company, Sulzer Unternehmungen A.-G. embraces to-day the following manufacturing companies, engineering offices and sales organizations :—Gebrüder Sulzer, Aktiengesellschaft, Winterthur,—Sulzer Bros. (London) Ltd., London,—Gebrüder Sulzer, Aktiengesellschaft, Ludwigshafen-on-Rhine,—Compagnie de Construction Mécanique Procédés Sulzer, Paris,—Chauffage Central Sulzer Société Anonyme, Paris,—Sulzer Centralheizungen G.m.b.H., Mannheim,—Sulzer Fréres, Société Anonyme, Bucharest,—Sulzer Hermanos, Sociedad Importadora Limitada, Buenos Aires,—Sulzer Frères, Cairo,—Sulzer Brothers, Calcutta,—Sulzer Brothers, Kobe,—Sulzer Brothers, Shanghai. Each of these firms is assisted in its activities by numerous agencies and sub-agencies and this extensive organization keeps the parent firm in touch with all principal markets.

The annual turnover of the firms belonging to the Sulzer concern in the years 1927 to 1930, i.e. after the termination of the previous crisis and before the present, reached a total of 120 million Swiss francs when working with a full complement of 9,000 to 10,000 workmen and staff. This sum is exclusive of internal invoices between the various members of the concern. In recent years a strong setback has naturally taken place, corresponding to the grave situation caused by the still prevalent general world crises.

The finely spun network of international trade has been completely wrecked by the War, and far from peace having been restored after its termination, the struggle continues as an intensified economic war organized and subsidized by the governments of some nations and threatens the very existence of a number of once flourishing Swiss export industries, in particular engineering. The upheaval which for years has shaken the life of the peoples of the world to its uttermost depths has not yet come to rest. What permanent change of the economic structure will result and how the economics of Switzerland will shape is still beyond the knowledge of man. One thing however is certain that whatever the future may hold, Swiss industry can only prevail in the future as hitherto by the utmost exertion to maintain quality. In the whole range of its activities it will be necessary to aim at the best possible results, especially in the field of scientific technical research.

State Steel-Works for Shanghai

Plans for converting the former Lunghua Arsenal in Shanghai into an iron and steel works are being made by the Ministry of War. With the outbreak of the Sino-Japanese hostilities in 1932 a large portion of the machinery of the arsenal was removed from Shanghai to the Nanking and Hanyang Arsenals ; the building and remaining equipment being placed in charge of a Custody Committee. Later the Ministry of War contemplated sale of the land occupied by the Arsenal, the proceeds of which were to be earmarked for the expansion of the Nanking and Hanyang Arsenals.

This scheme, however, was opposed by the Greater Shanghai Chamber of Commerce, which claimed that the proceeds of any sale should first be used for the repayment of a loan for $800,000 advanced by the Chamber in 1925 for repatriation of retreating soldiers during the struggle between Generals Chi Hsieh-yuan and Lu Yung-hsiang, then Tuchun of Kiangsu and Chekiang respectively. The property of the Arsenal was given as security for this loan.

In compliance with the petition of the Greater Shanghai Chamber of Commerce, the Ministry of Finance was instructed to devise measures with the various organs concerned for the settlement of the loan obligations. Such measures are being discussed between deputies of the Finance Ministry and the Arsenal and Commissariat Administrations of the Ministry of War.

To promote the development of domestic industries, it is now learnt that the Ministry of War is contemplating the erection of an iron and steel-works on the site of the Shanghai Arsenal.—*Chinese Economic Bulletin.*

New Canton Electric Plant

The Canton Municipal Government has signed a contract with Siemens China Company for the supply of a new electric power station with necessary equipment at a cost of $2,500,000 Hongkong currency. The new works will be installed by 1935 at Sai Chuen on the western outskirts of the city.

Capable of supplying 30,000 kilowatts, the machinery is accepted by the city government after keen competition by other well-known firms and can produce electric power twice as much as by the present plant on the Bund. Negotiations for the installation of this plant had been going on for two years.

While this power station will supply electricity for use within Canton city, electric power outside of Canton will be provided by the new hydro-electric plant to be erected at Yung Kiang, a tributary of the North River. Four years will be required to complete this generating station, the cost being $20,000,000 Hongkong currency.

Three German engineers are now at Yung Yuen on the Yung Kiang river making designs to build this gigantic hydro-electric plant in collaboration with experts from the Provincial Department of Reconstruction. When completed, the station will be able to supply electricity to a radius of 250 miles at a very low cost.

The water power at Yung Yuen can be utilized to generate electric power. Apart from the construction expenses and the cost of machinery, the water power does not cost anything. Hence the current expenses for fuel are very low. This plant will electrify many towns and factories in Kwangtung.

Engineering Notes

INDUSTRIAL

NEW PAPER MILL—Chinese sources state that with a view to improving the industries, the authorities of the Canton Reconstruction Department have recently decided to establish a large paper mill in that city. Experts of the Executive Committee have been sent out to make investigations and it is reported that the Pak Kong and Fat Shan Districts were found to be the most suitable places, as they are rich in forests and have numerous waterfalls.

PAPER PULP FACTORY—Formal sanction for a proposed pulp manufacturing industry for Manchoukuo has been obtained by promoters of the enterprise, including representatives of the Okawa, Kawanishi, Oji Paper and Terada interests in Tokyo and Osaka. The Manchuria Pulp Co., Ltd., capitalized at Y.10,000,000, will be founded as a result. Its annual capacity will be 30,000 tons, and its products are expected to be marketed early in 1935. The company's head office is in Osaka and the factory in Kirin.

JOHORE PUBLIC OFFICE—A large building program has been budgeted by the Johore Government for the current year at an estimated cost of $1,643,707. The more important buildings are as follows: Permanent Government offices, Johore Bahru, $294,550; new police depot, Johore Bahru, $200,000; police quarters, Johore Bahru, $107,000; alterations to Istana and Dewan, $100,000; police station, Batu Pahat, $85,000; new school, Johore Bahru, $61,500; refuse destructor, Muar, $60,000; trade school, Johore Bahru, $55,000. The proposed new offices, as planned, is a handsome and imposing quadrangular block of the modern style with a large courtyard, so that every room will be well ventilated and lighted.

MACAO DEVELOPMENTS—Arrangements between the Macao Government and Japanese industrialists have been completed under which the latter have secured certain rights to erect in the Portuguese Colony a sugar factory, brick kilns, breweries and a workshop for the manufacture of drugs. Negotiations are also afoot for the building of a Japanese match factory.

JAPAN'S CHEMICAL INDUSTRY—Japanese business firms are striving to revitalize the chemical industry to keep pace with the unusual prosperity of munitions plants. Sumitomo interests plan to expand output by doubling its capital from Y.10,000,000 to Y.20,000,000. Not only will equipment for manufacturing ammonium sulphate be increased, but the company will produce other industrial chemicals and aluminium as well. Mitsui interests have become more than ever interested in the chemical industry. Production of the Mitsui Mine factory and the Miike Dyestuff Works will be doubled. Mitsui founded the Toyo High Pressure Industry Company last year to produce nitrogen, blasting powder and liquid coal. The Mitsubishi Mining Company is preparing to concentrate on coal liquefaction, ammonium sulphate, aluminium and coal tar dyes, as well as other chemicals.

RAILWAYS

YUSHAN-PINGHSIANG RAILWAY—Regarding the proposed $12,000,000 loan for the construction of the Yushan-Pinghsiang Railway in Kiangsi, the Legislative Yuan at Nanking has decided that it will be floated by the Ministry of Railways or the Ministry of Finance instead of the Kiangsi Provincial Government.

RAILWAY ORDERS—Japanese car and locomotive manufacturing companies recently have received orders from Manchoukuo through the South Manchuria Railway Company for 60 locomotives and cars worth about Y.10,000,000.

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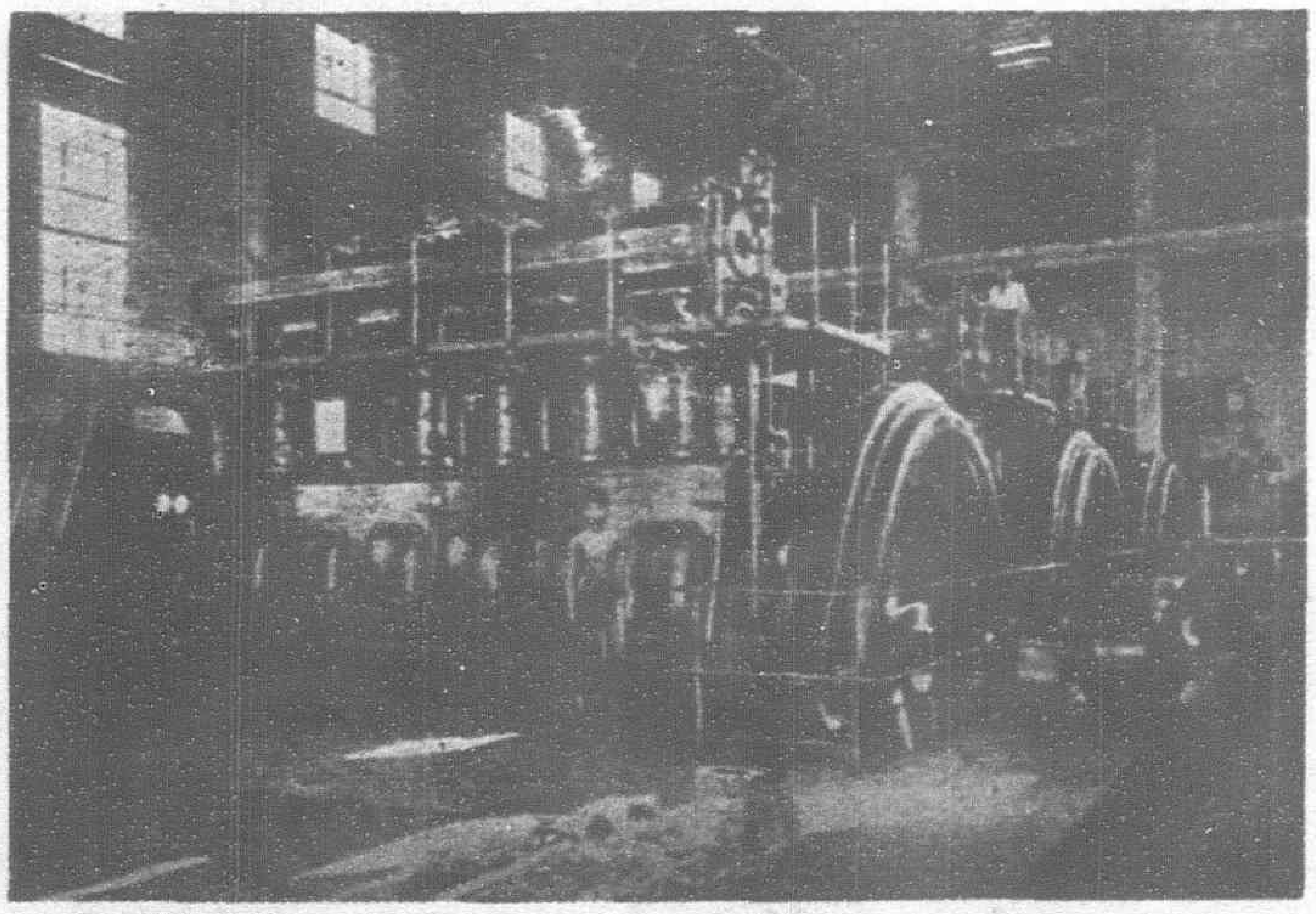

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